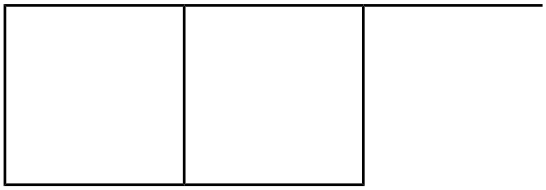
NAME (Print): _____

SIGNATURE: _____

Chemistry 320N
Dr. Brent Iverson
10th Homework
April 16, 2024

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



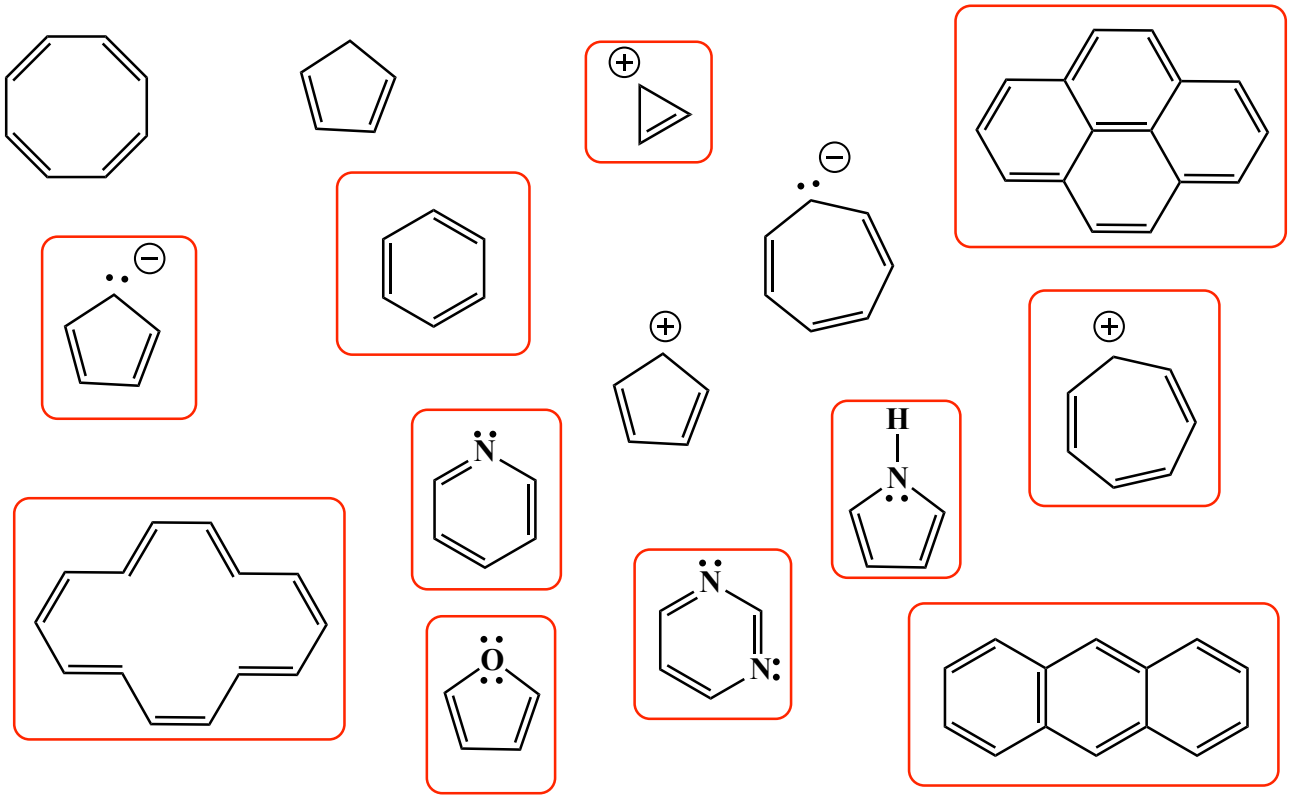
1. (1 pt. each) Here are a number of statements regarding conjugation and light absorption/ emission. Do not second guess yourself, this is not meant to be tricky! **Check the appropriate box to indicate whether the statement is true or false.**

	True	False
A. When using molecular orbital theory, it is best to think of electron density as being like waves, since it is described mathematically using wave equations.	X	
B. When molecules absorb light, electrons are excited from a bonding to an antibonding molecular orbital.	X	
C If a substance absorbs blue light, it will appear blue to our eyes.		X
D. The larger the number of pi bonds involved in a conjugated molecule (a "pi-way") the smaller the energy gap between the higest occupied pi molecular orbital and the lowest unoccupied molecular orbital.	X	
E. A reaction is said to be under kinetic control if the ratio of products is dependent on the relative energies of the products.		X
F. A reaction is said to be under thermodynamic control if the ratio of products is dependent on the relative energies of the products.	X	
G. Fluorescence occurs when a photon is emitted as an electron relaxes from an antibonding molecular orbital back to a bonding molecular orbital in a molecule that has absrbed light.	X	
H. Phosphorescence occurs when a chemical reaction generates a product in an excited state.		X
I. Phosphorescence occurs when an electron must flip its spin before relaxing back to a bonding molecular orbital while emitting a photon.	X	
J. The light from a green laser will go through your finger, while the light from a red laser is absorbed.		X

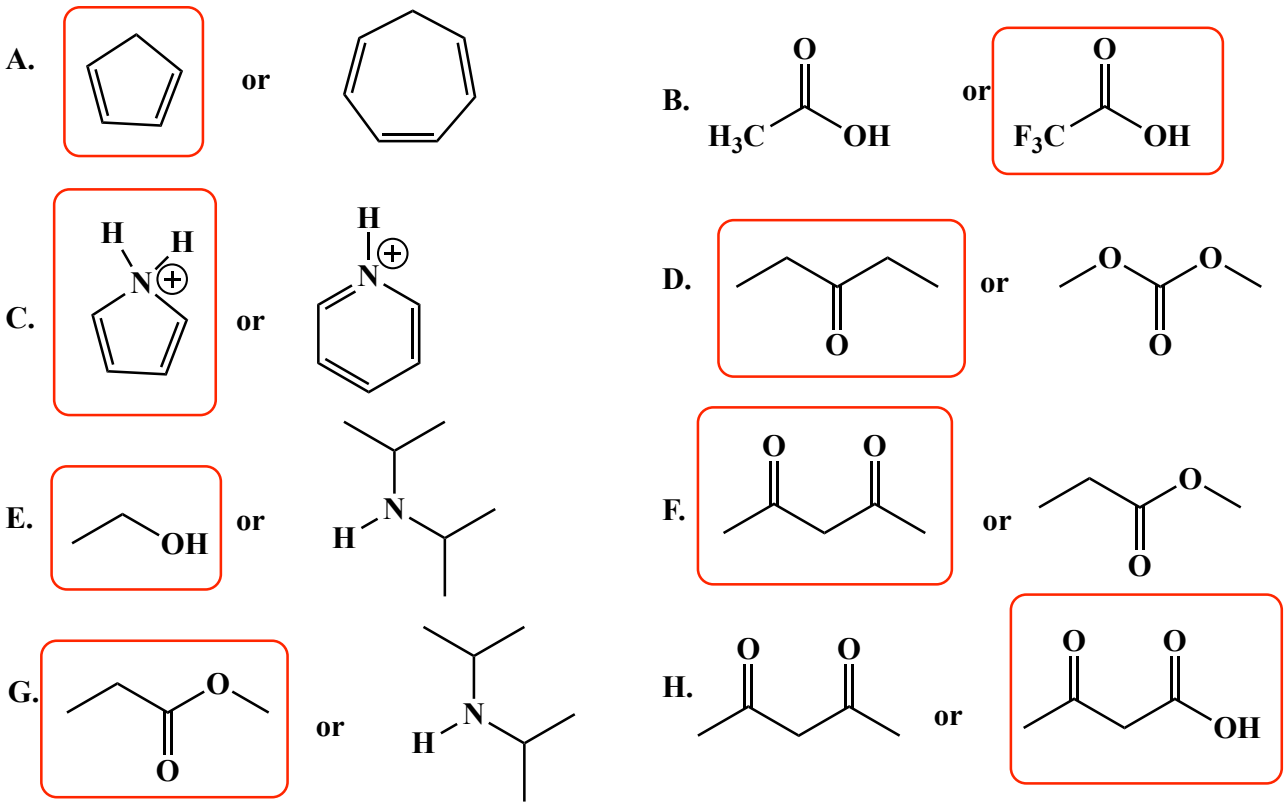
2. (8 points) Aromaticity is a term that refers to molecules with characteristic pi systems. A theorist named Hückel helped to derive several criteria that can be used to determine if a molecule is aromatic. List all four of these criteria:

1. The molecule is flat
2. All atoms of the ring must be sp^2 (or sp in rare cases) hybridized
3. The molecule is monocyclic
4. There must be "4n + 2" pi electrons in the pi system, where n = 0, 1, 2, 3, 4, 5,.....

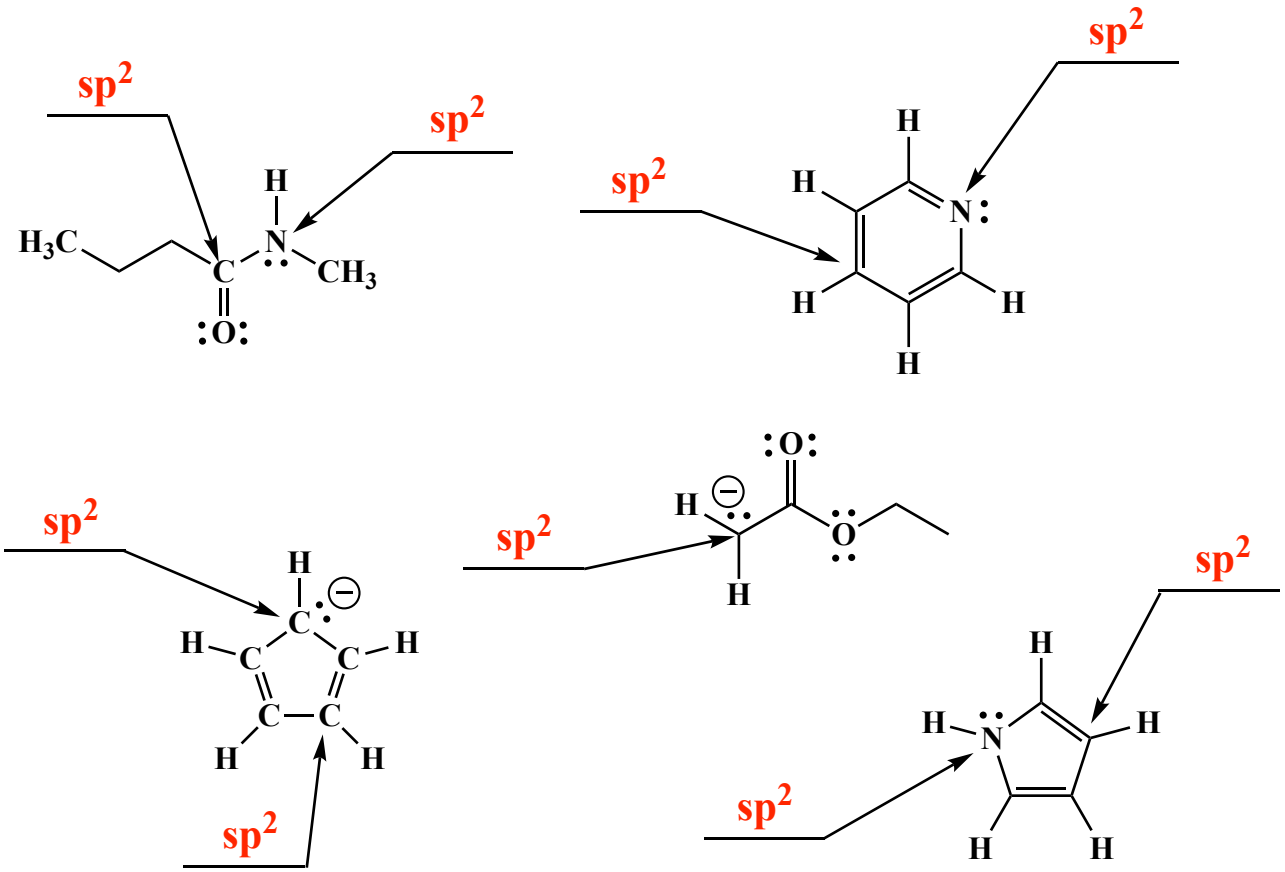
3. (15 points) **Draw a circle around** all of the molecules below that **can be considered aromatic.**



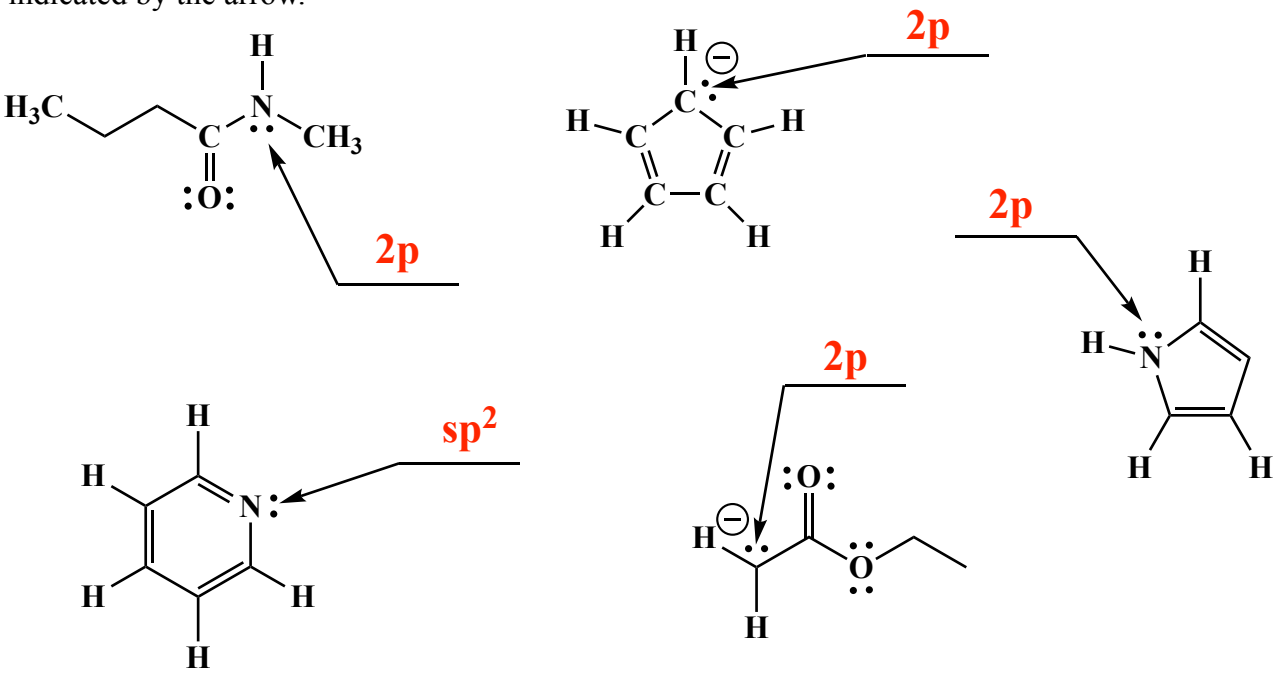
4. (16 points) **For each pair of molecules, circle the one that is more acidic.**



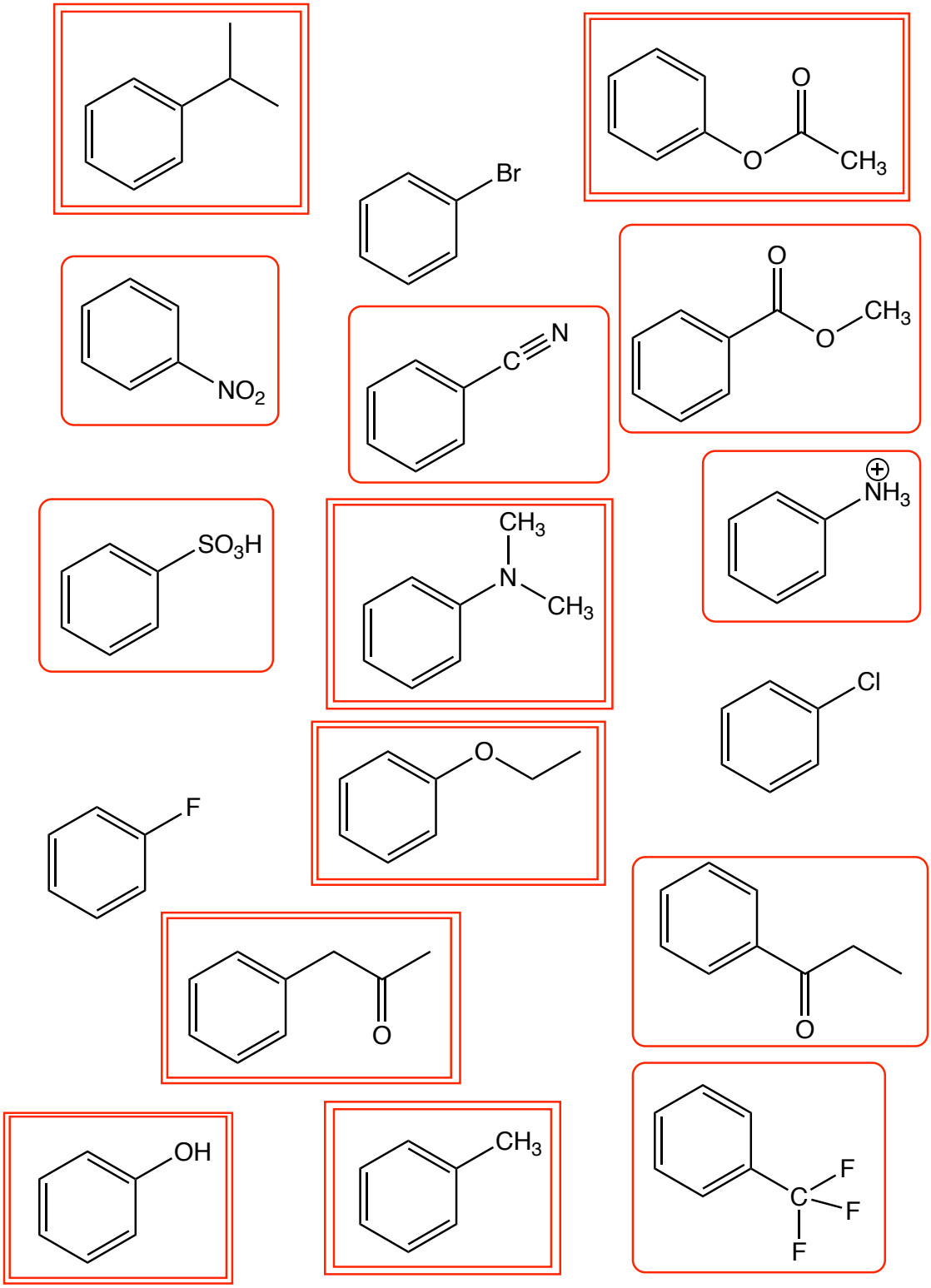
5. (9 points) On the lines provided, state the **hybridization state of the atom** indicated by the arrow.



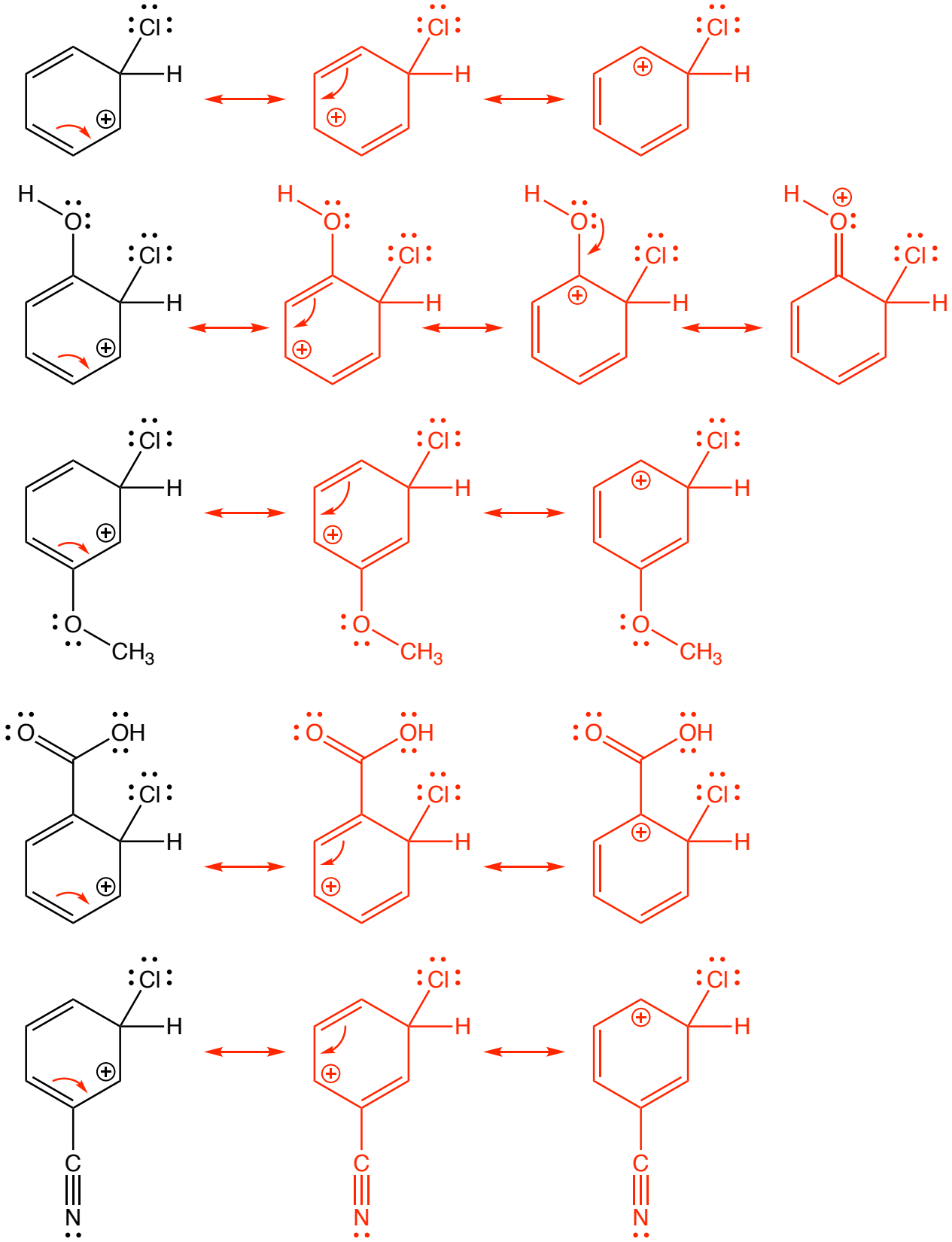
6. (5 points) On the lines provided, state the **atomic orbital that contains the lone pair** of electrons indicated by the arrow.



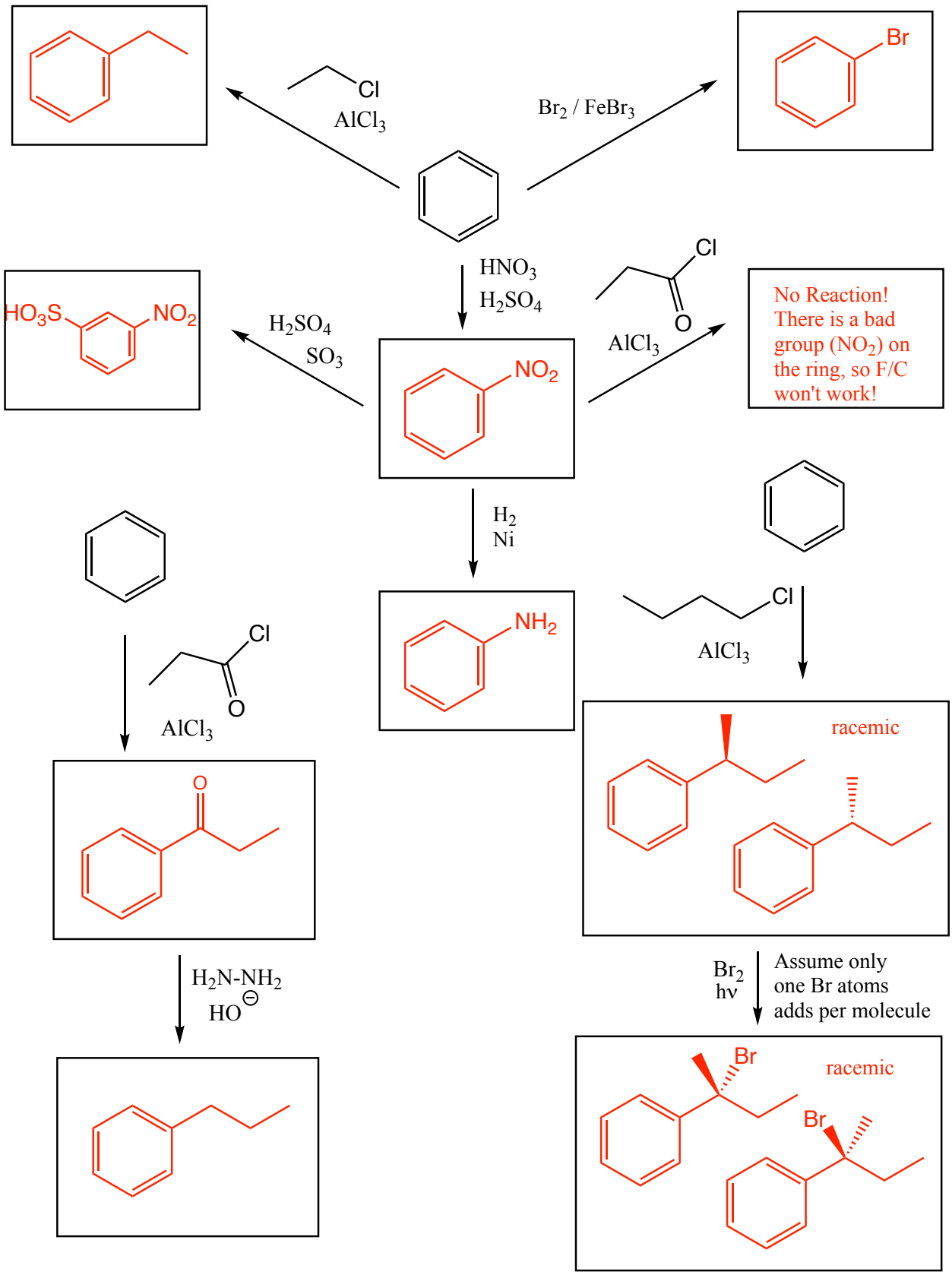
7. For each of the following, circle the derivatives that have a "bad" group on them, draw two boxes around the derivatives that have a "good" group on them, and draw nothing around the derivatives that have an "ugly" group on them.



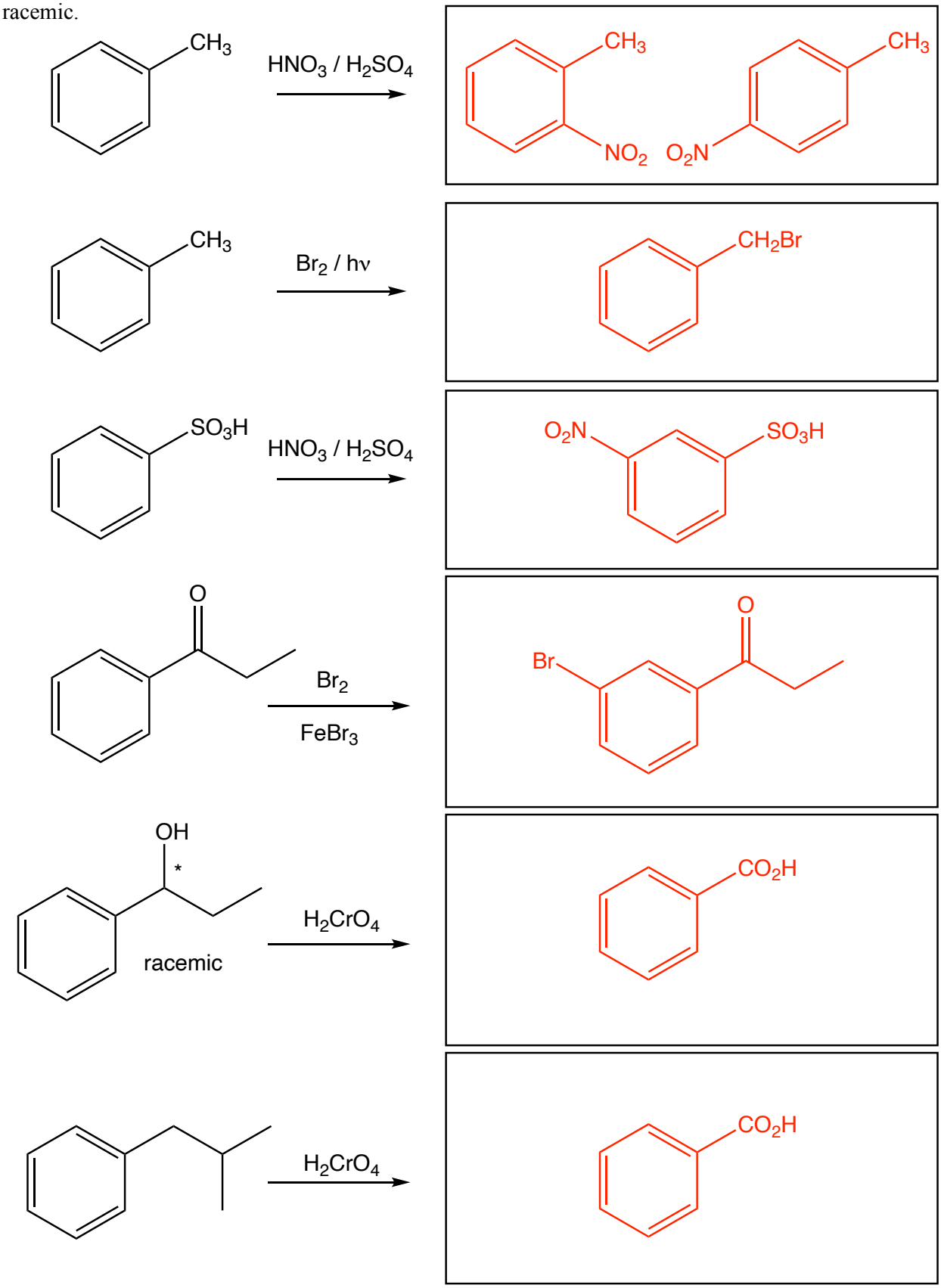
8. For each of the following arenium ion intermediates, draw all the significant resonance contributing structures.



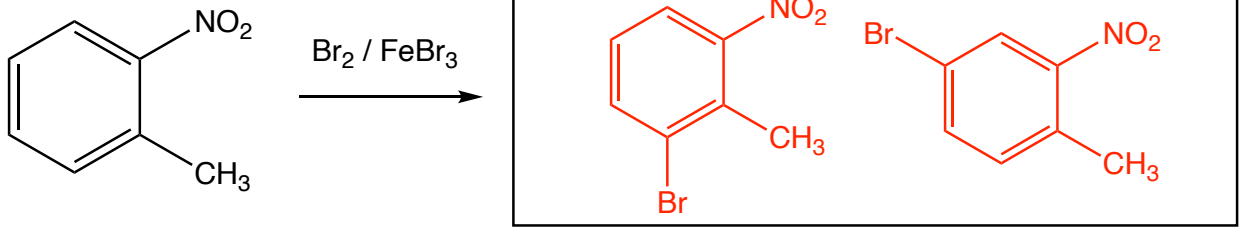
9. For each of the following, fill the molecule in the box that is the product or products of the given reaction. When a racemic mixture of enantiomers are formed, draw both using wedges and dashes and write racemic.

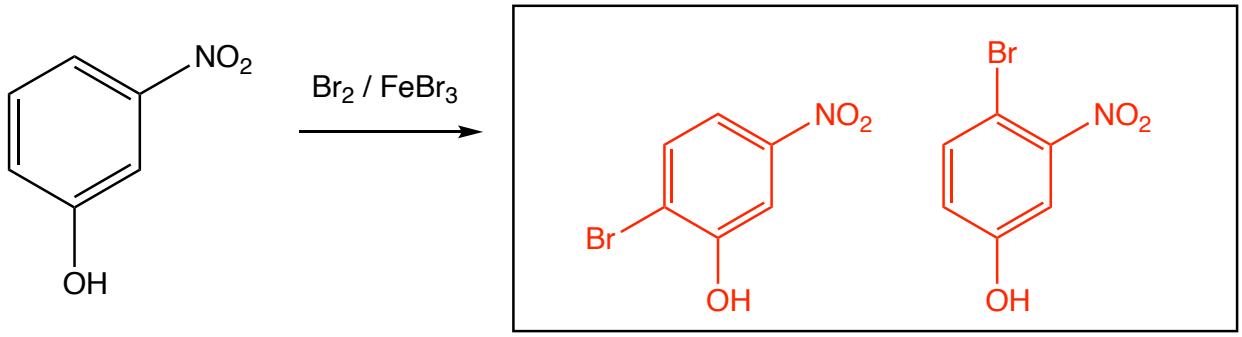


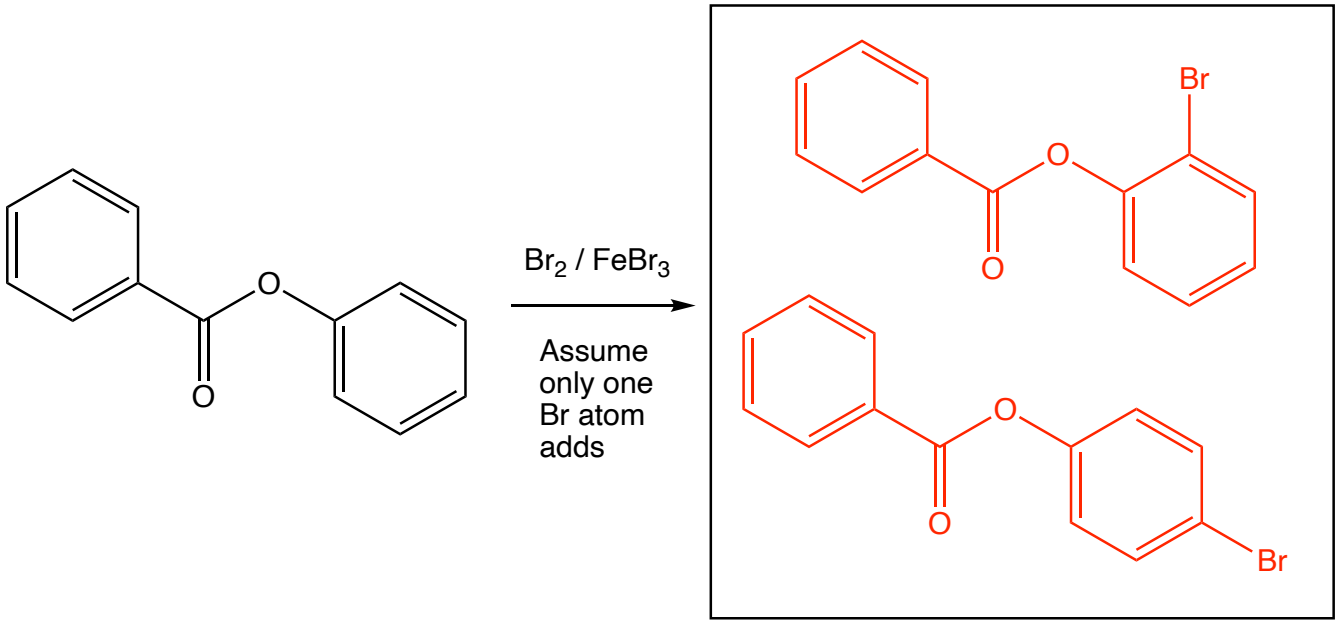
10. For each of the following, fill the molecule in the box that is the product or products of the given reaction. When a racemic mixture of enantiomers are formed, draw both using wedges and dashes and write racemic.

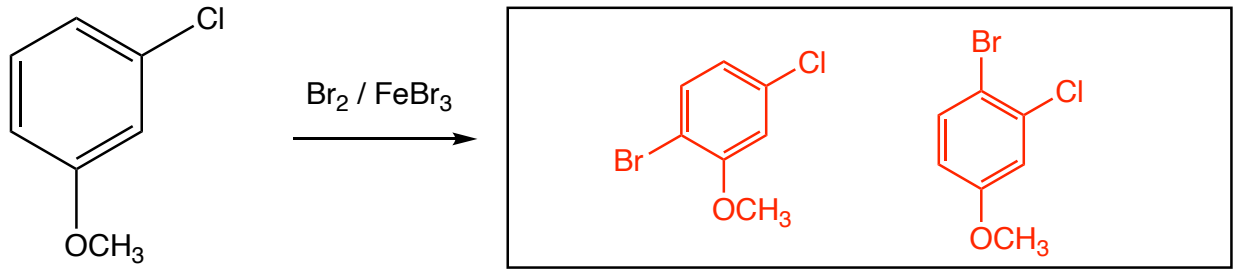


10. (cont.) Fill in the boxes with the product or products of each reaction. You must draw both ortho and para products if that is appropriate. These are a little bit harder than on the previous page.

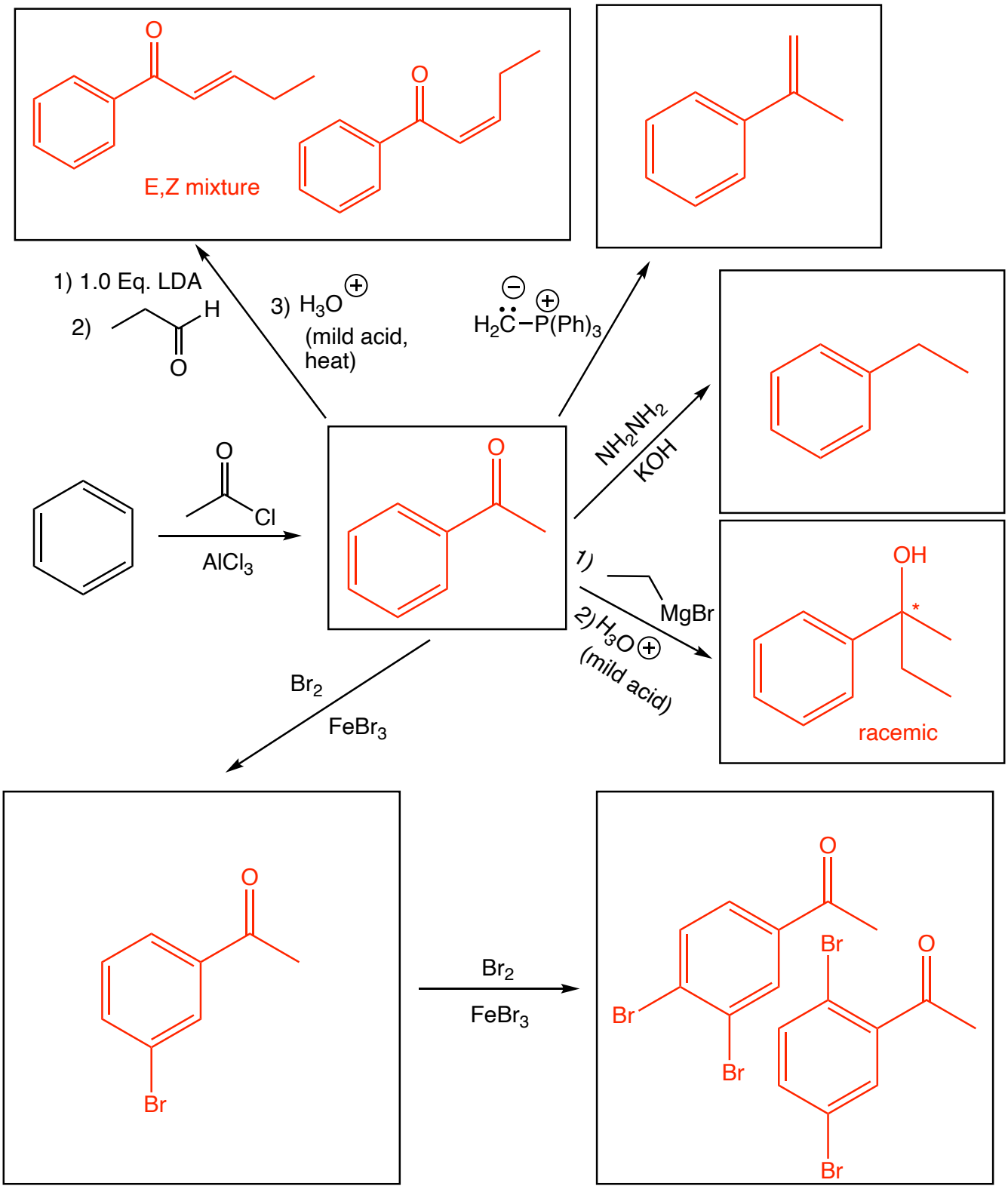




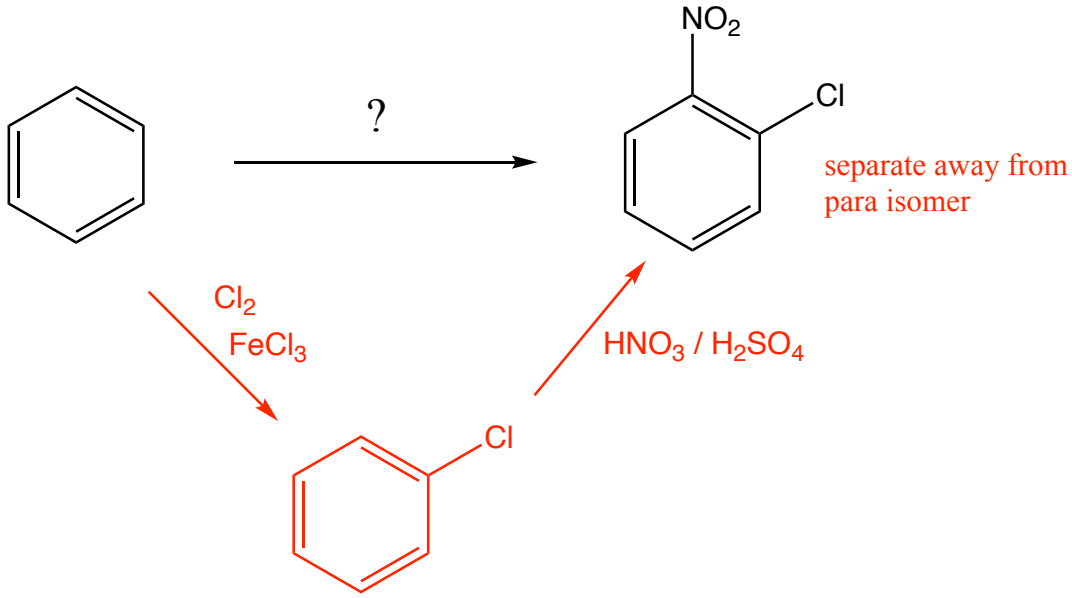




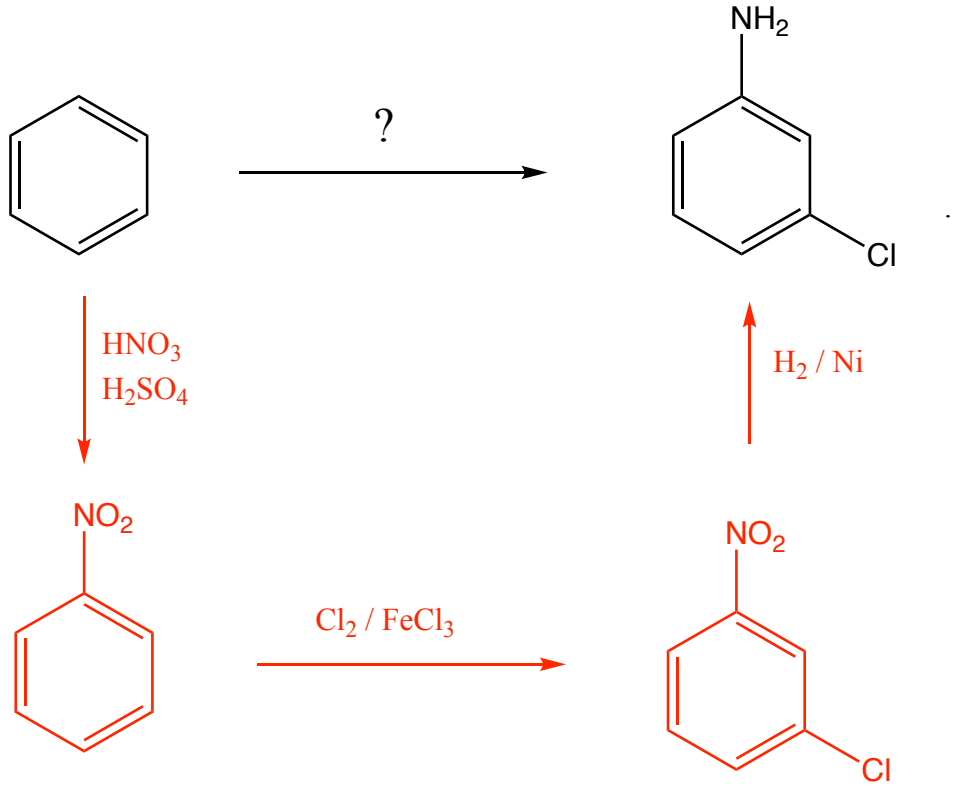
11. For the following reactions, fill in theboxes with the predominant product or products. When ortho/para products are both produced, you must draw both. When a new chiral center is produced, put an asterisk (*) next to it. If a racemic mixture is produced, you must write racemic. If an E/Z mixture is produced, draw both products. I know these are complicated directions, so you might want to read them again so you know what we want.



13. Show reagents and intermediates synthesized along the way that allow you to produce the product from the given starting material. Assume you can isolate either the ortho or para product in pure form, even though both are usually produced together.



14. Show reagents and intermediates synthesized along the way that allow you to produce the product from the given starting material. Assume you can isolate either the ortho or para product in pure form, even though both are usually produced together.



15. Here is a change of pace. For the following reactions, circle the nucleophile and draw a box around the electrophile. Draw the product(s) of the reactions, using the standard format for your answers.