

UCSC, Binder Name _____

Student ID # _____

Organic Chemistry
EXAM 2 (300 points)

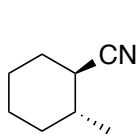
In each of the following problems, you will use your knowledge of organic chemistry conventions to answer the questions in the proper manner. Be sure to read each question carefully. For extra credit, write down your favorite summer location on the last page of the exam. You have the entire class period (2 hours) to complete this exam. Pay attention to point values and problems to skip to use your time wisely.

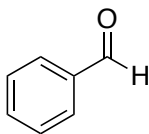
Keep your eyes on your own paper. Electronic devices of any kind are not allowed, including cell phones and calculators. Any student found using any of said devices, or found examining another student's exam, will be promptly removed from the exam room and at minimum will receive a zero on this exam. Such an incident may also be considered a form of academic dishonesty and reported to the UCSC Judiciary Affairs Committee.

1 (55)	
2 (50)	
3 (50)	
4 (50)	
5 (40)	
6 (45)	
Total	

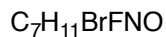
1. Fundamentals & Nomenclature

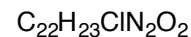
(a) (10 points) Indicate the **degrees of unsaturation** in the following structures or formulas on the line provided.



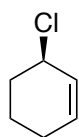


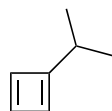


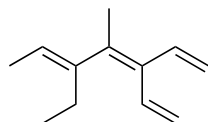




(b) (15 points) Provide the IUPAC name for the following compounds. Include stereochemistry in the name, where appropriate.







(c) (12 points) **Draw structures** corresponding to the following names.

(3E,5Z)-2,6-Dimethyl-1,3,5-octatriene

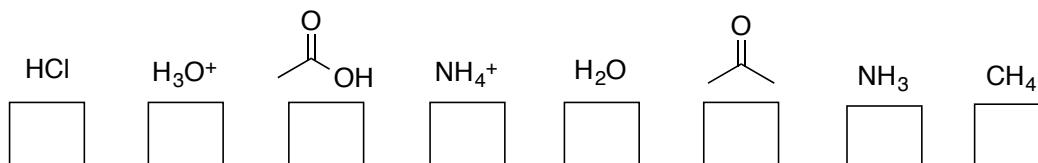
4-Methyl-1,3-pentadiene

(d) (18 points) For each functional group, **draw a simple (3 carbon-containing) example**. These examples must be complete molecules in skeletal (zig zag) representation, without R groups.

Ketone	Aldehyde	Alcohol	Alkyl Halide	Alkene	Alkyne

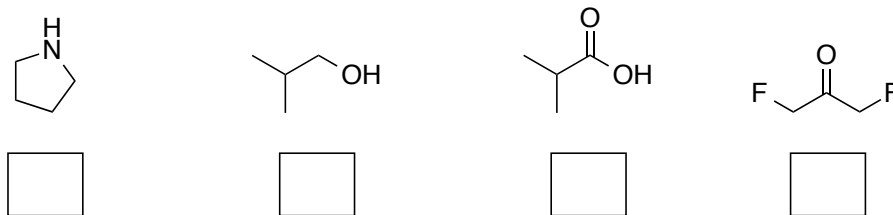
2. Acid-Base Chemistry

(a) (16 points) The following compounds are listed in order of acidity (most acidic on the left). Indicate the approximate **pKa value** that belongs to each compound in the boxes provided.

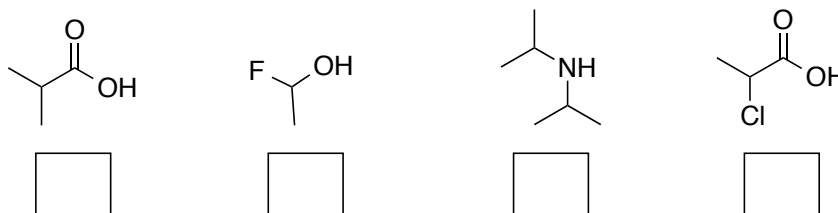


(b) (20 points) Rank the following sets of molecules from **most acidic (1)** to **least acidic (4)**.

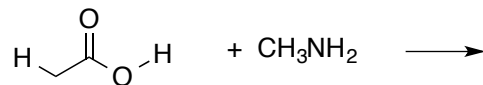
(i) Set 1



(ii) Set 2



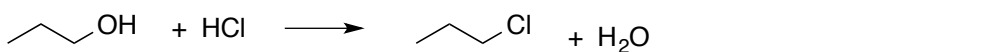
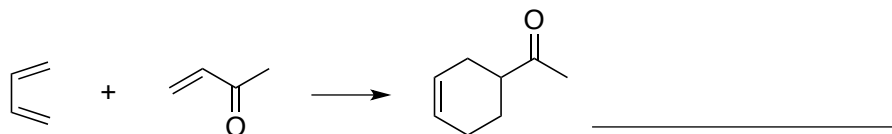
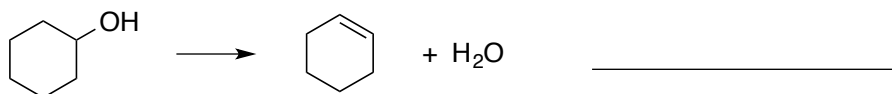
(c) (14 points) Choose the **more acidic proton** and **draw the products** in the following reaction. No arrow-pushing necessary.



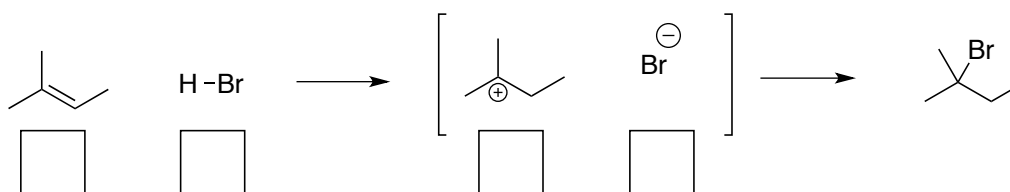
* Circle the more acidic proton.

3. Reaction Warm-up

(a) (15 points) Identify the following reactions as **addition, elimination, substitution, or rearrangement**.

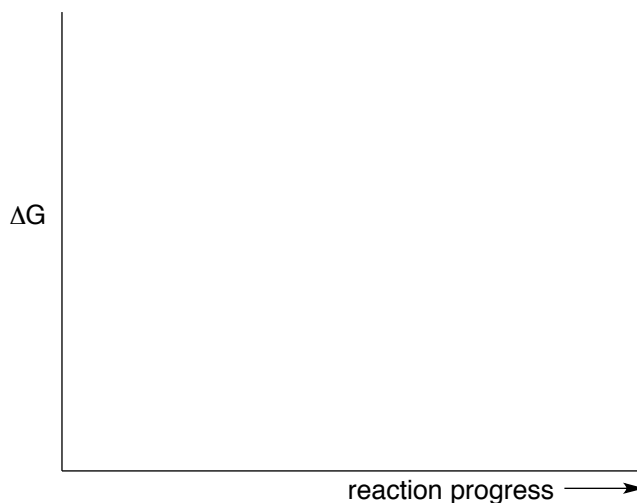


(b) (15 points) **Add curved arrows** to show the mechanism in the following reaction. Clearly label the reactants in both steps as either a **nucleophile (N)** or **electrophile (E)**.



(c) (20 points) **Sketch a reaction energy diagram** for the reaction above. This is an **exergonic reaction** where the **first step is rate limiting**. Be sure to label the following on the diagram:

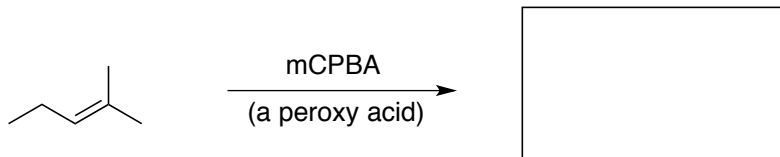
- Reactant (R)
- Product (P)
- Intermediate (I)
- Transition States (\ddagger)
- Activation Energies (E_a)



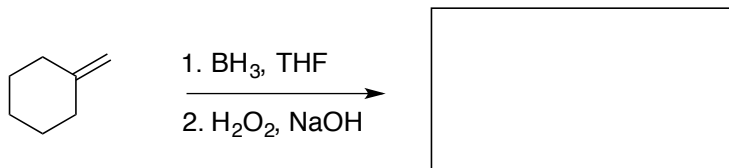
4. (50 points) Single Step Reactions

FILL IN EACH BOX with the missing reactant, reagent/solvent, or product. It is not necessary to include stereochemistry (wedges or dashes) in any of the structures.

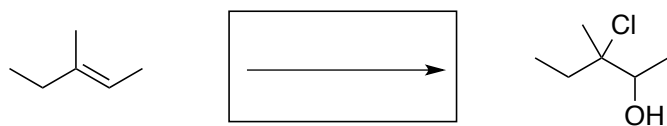
(a)



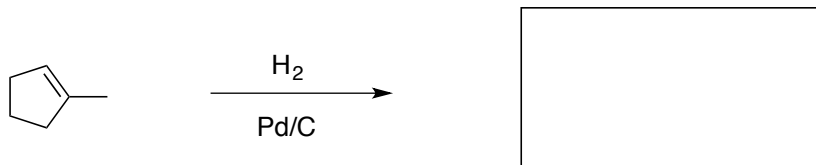
(b)



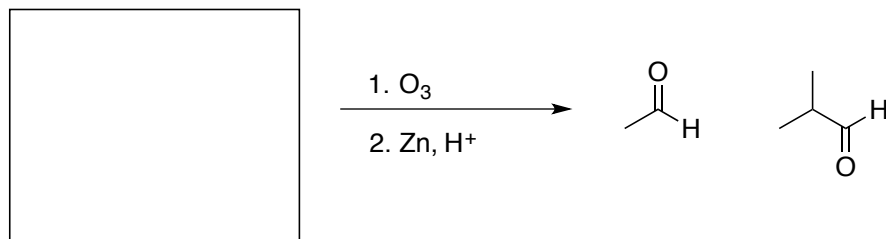
(c)



(d)

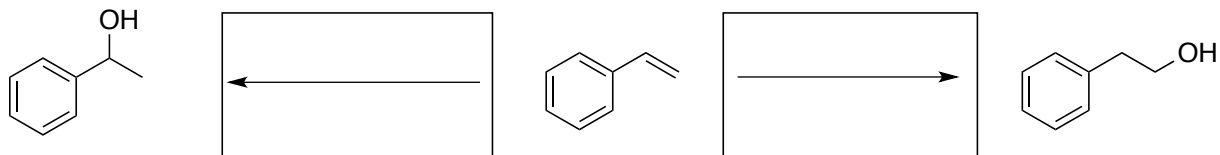
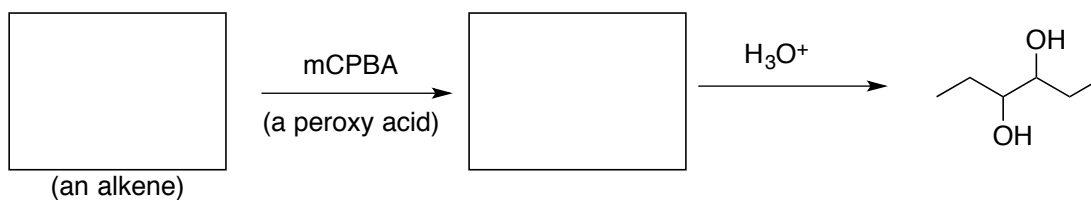
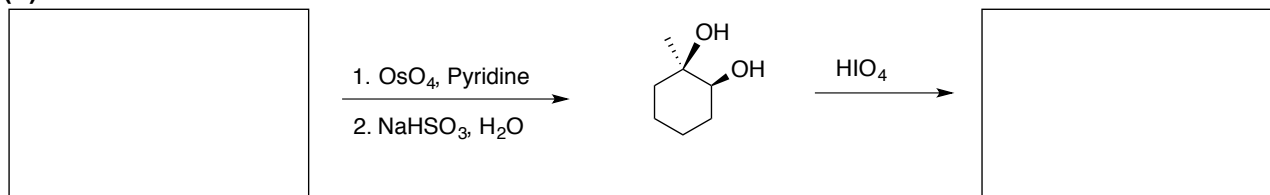
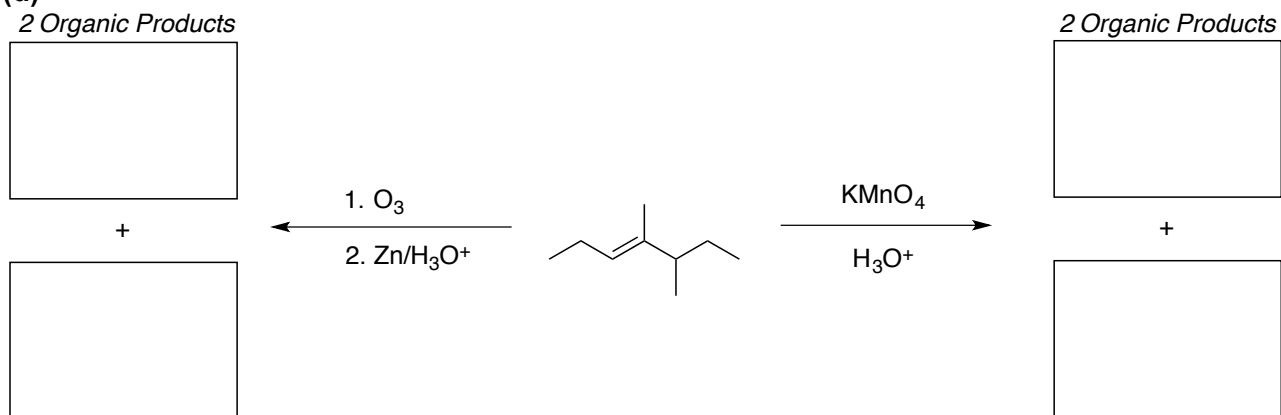


(e)



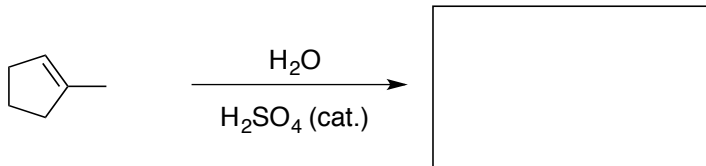
5. Reaction Puzzles

(40 points) Fill in the box with the missing reactants, reagents, or products. It is not necessary to include stereochemistry (wedges or dashes) in any of the structures.

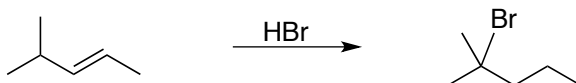
(a)**(b)****(c)****(d)**

6. (45 points) Reaction Mechanisms – Choose one of the following. Draw a large “X” over the part you are skipping, *otherwise (a) will be graded, even if it is blank*.

(a) The acid-catalyzed hydration of 1-methylcyclopentene provides a single alcohol product. Draw the **step-wise arrow-pushing mechanism**, including **reaction intermediate(s)**, and the **product** of this reaction.



(b) The electrophilic addition of hydrobromic acid to 4-methyl-2-pentene gives an unexpected product due to a rearrangement. Show the **step-wise arrow-pushing mechanism** for this reaction, including **reaction intermediate(s)**, and **briefly explain** why this rearrangement occurred.



Draw a large “X” over the part you are skipping, *otherwise (a) will be graded, even if it is blank*.