

CHEM 8B Organic Chemistry II
EXAM 2A, Summer 2017 (300 points)

In each of the following problems, use your knowledge of organic chemistry conventions to answer the questions in the proper manner. **Be sure to read all questions & instructions carefully, paying special attention to directions to skip parts of problems.** Choose which problems to skip rather than doing every problem, otherwise you may run out of time. **Make sure it is crystal clear which problems should and should not be graded.** Write your last name and first initial on the top of every page. You will have the entire class period to complete this exam. You are welcome to use pre-built models.

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 (50) | |
| 2 (52) | |
| 3 (50) | |
| 4 (48) | |
| 5 (50) | |
| 6 (50) | |
| Total | / 300 |
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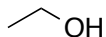
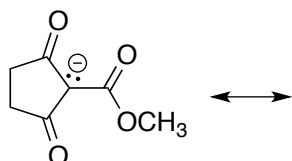
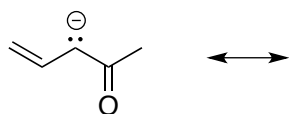
1. Nomenclature & Fundamentals**(a) (16 points) Draw structures** corresponding to the following names.

Phenyl benzoate

Isopropyl 2-methylpropanoate

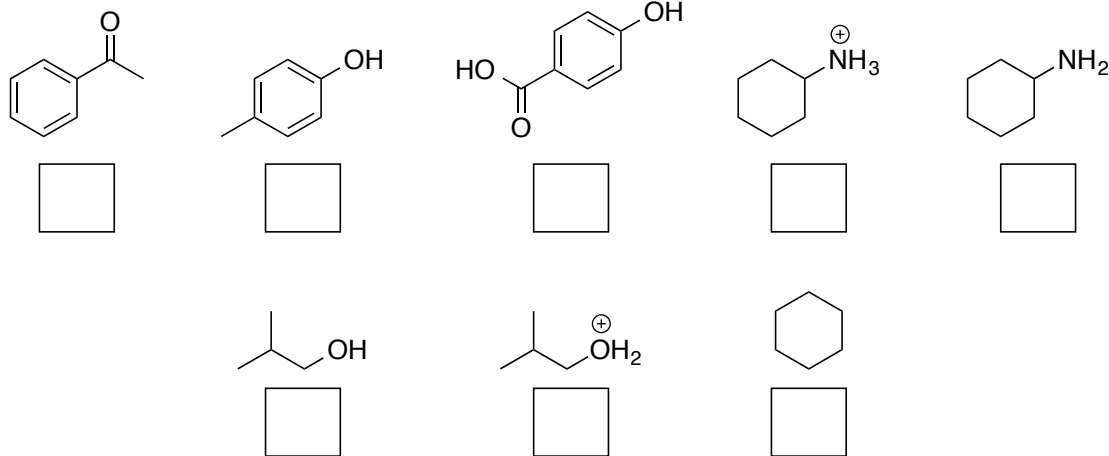
Phenylacetaldehyde
(2-Phenylethanal)

2,4-Dimethylpentanenitrile

(b) (10 points) Nucleophile vs. Electrophile. Indicate whether the following functional group, type of compound, or reagent is more likely to act as a nucleophile (N) or electrophile (E) based on the reactions covered in this class.**Methoxide ion****Acids****Bases****Carbocations****Cyanide ion****(c) (24 points) Resonance.** Use *curved arrow* notation to indicate electron movement and draw *two non-equivalent* resonance structures of the compound below.

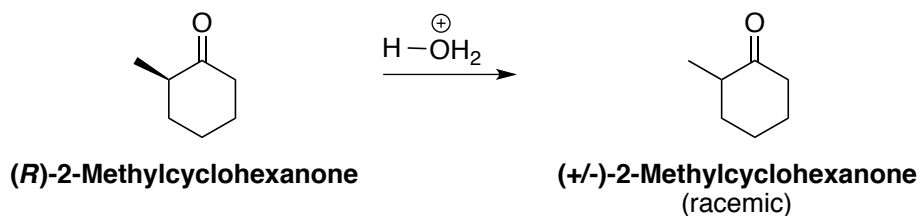
2. Acid-Base & Mechanism Warm-up

(a) (10 points) Indicate the **approximate pKa** of each in the box provided below the compound. The compounds are not given any particular order.

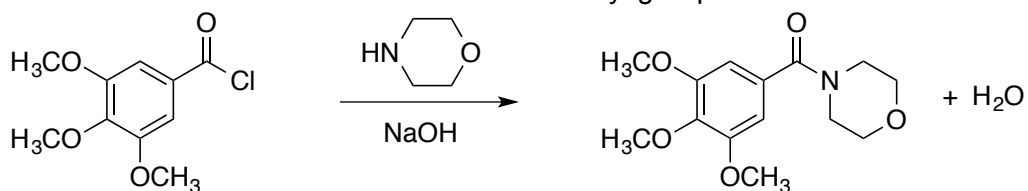


(b) (20 points) **Tautomers.** When optically active (*R*)-2-methylcyclohexanone is treated with aqueous acid, racemization occurs.

Explain using **arrow pushing, intermediates, and less than ten words**. Use phrases in reference to structures, no essays or complete sentences please.

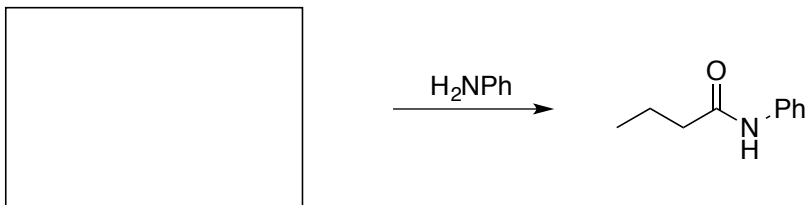


(c) (22 points) Trimetozine, a sedative, is prepared commercially through a **base-catalyzed nucleophilic acyl substitution** reaction between morpholine and the following acid chloride. Show the mechanism and feel free to abbreviate the aryl group as "Ar" in the intermediate(s)!

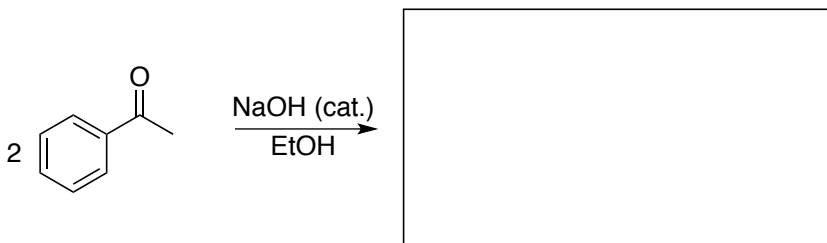


3. (50 points) **Single Step Reactions** – Fill in the boxes with the missing reactant, reagent(s), or products.

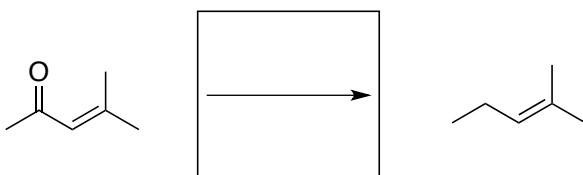
(a)



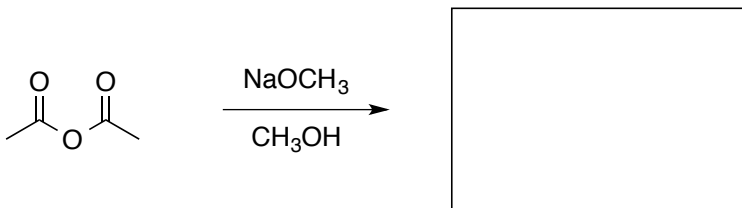
(b)



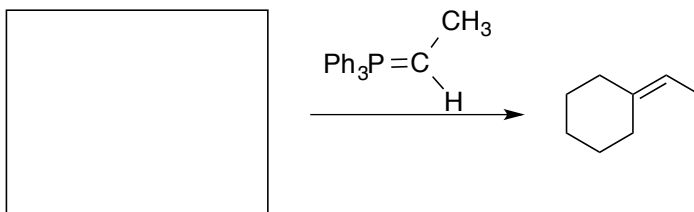
(c)



(d)

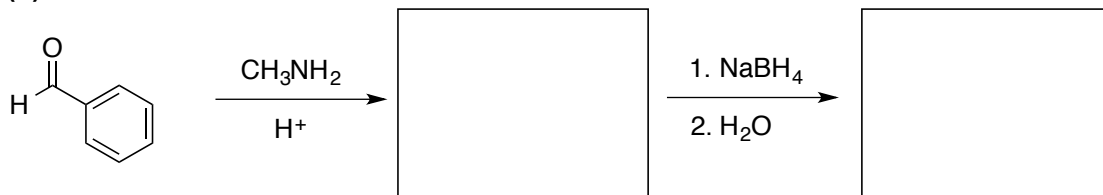


(e)

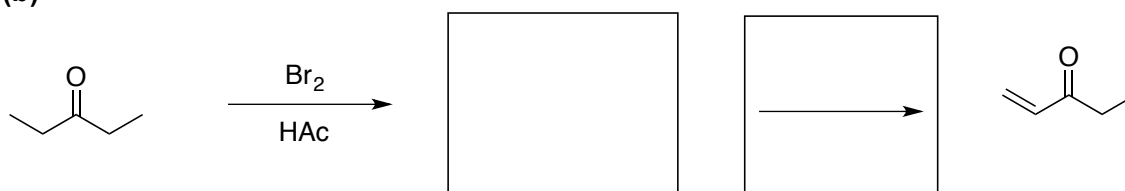


4. (48 points) **Mini Reaction Puzzles** - Fill in the box with the missing reactant, reagent(s), or product. *SKIP ANY ONE PUZZLE with big "X" over the entire reaction, otherwise the first four (a-d) will be graded.*

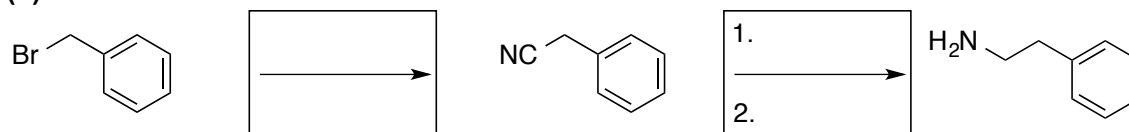
(a)



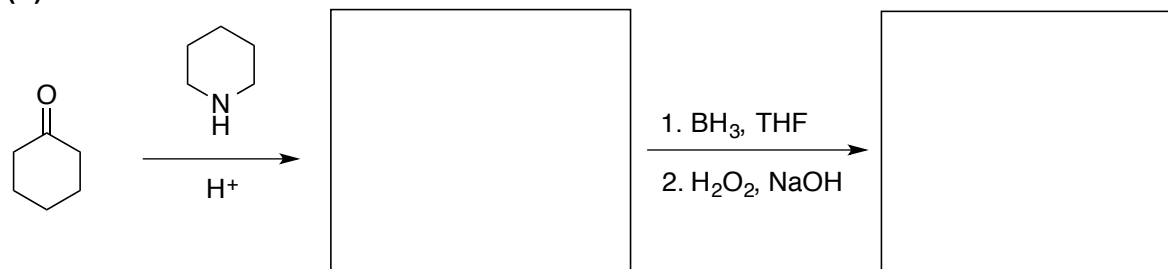
(b)



(c)



(d)



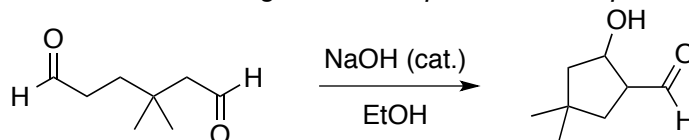
(e)



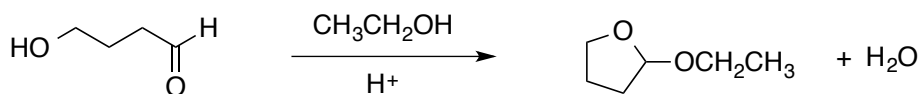
5. Mechanisms – Draw the full arrow-pushing mechanism for **both reactions** below, including all arrows for acid-base reactions (no “PT”). Include all intermediates with proper charges circled for each step.

(a) (25 points) 4,4-Dimethyl-1-cyclopentene carbaldehyde is made through a **base-promoted intramolecular aldol cyclization** of the dialdehyde below. Propose a mechanism to explain the formation of the indicated product.

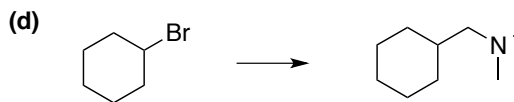
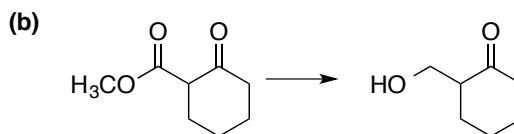
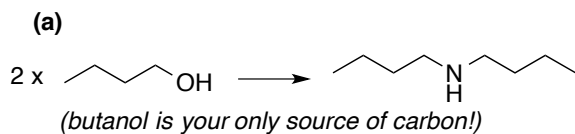
Pro tip: number the carbons in the starting material & product to keep track of the gem-dimethyl.



(b) (25 points) The following **acetal** is made through an **acid-catalyzed intramolecular cyclization** reaction. The mechanism proceeds by **nucleophilic addition and dehydration** followed by second **nucleophilic addition**. Show this mechanism.



6. (50 points) **Multi-Step Synthesis** - Carry out any two of the syntheses below using the starting material provided and any other reagents or carbon sources needed. Draw the product after each synthetic step. No mechanisms.

CHOOSE ANY TWO

PUT A LARGE "X" OVER THE REACTIONS YOU ARE SKIPPING & DO NOT WANT GRADED