

Chemistry 35

Exam 3

April 26, 2006

Print your name and SISD number on **EVERY PAGE** of the exam.

Write all answers on the exam.

There are two blank pages at the end of the exam for you to use as scratch paper.

1. (18 points) _____

2. (7 points) _____

3. (10 points) _____

4. (15 points) _____

5. (12 points) _____

6. (18 points) _____

7. (20 points) _____

Total (100 points) _____

IA	IIA	IIIA	IVA	VA	VIA	VIIA	GASES
1 H 1.00797						1 H 1.00797	2 He 4.0026
3 Li 6.939	4 Be 9.0122	5 B 10.811	6 C 12.0112	7 N 14.0067	8 O 15.9994	9 F 18.9984	10 Ne 20.183
11 Na 22.9898	12 Mg 24.312	13 Al 26.9815	14 Si 28.086	15 P 30.9738	16 S 32.064	17 Cl 35.453	18 Ar 39.948

ΔG° (equatorial \rightarrow axial) (kcal/mole)

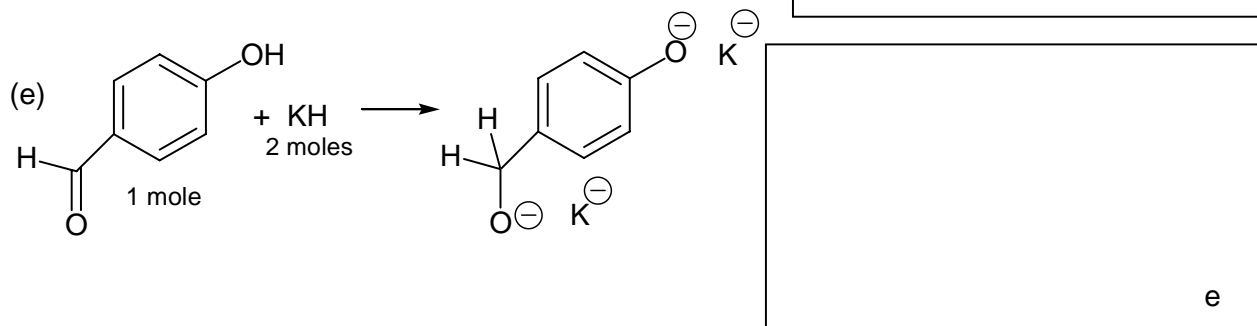
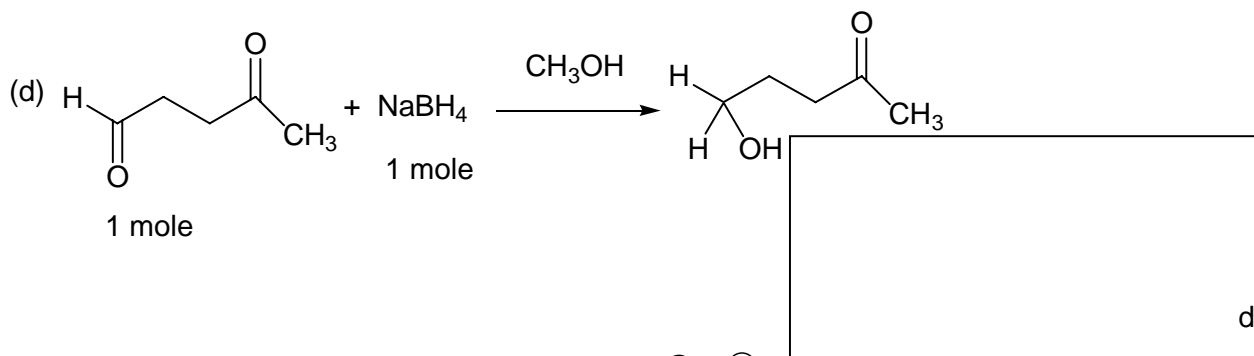
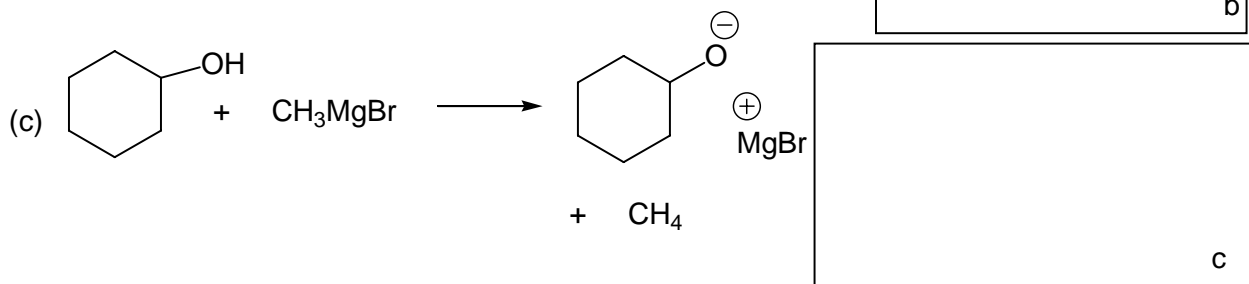
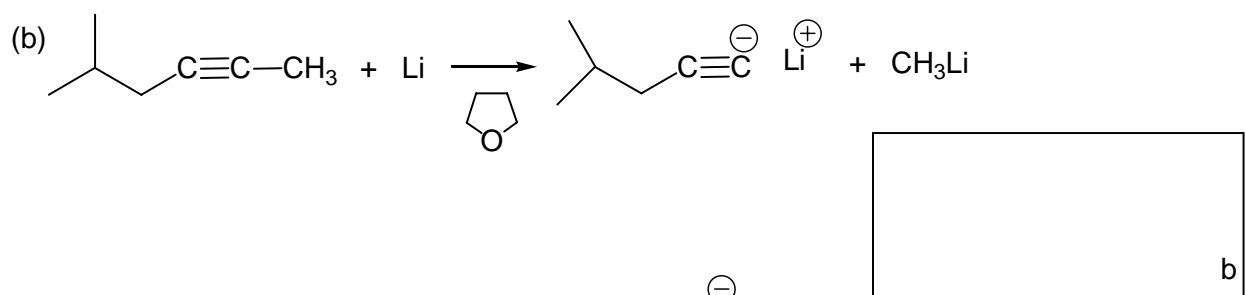
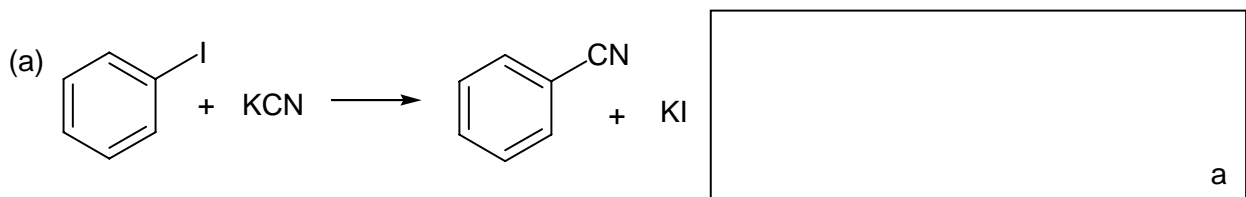
-H	0.0	-CO ₂ H	1.4
-F	0.2	-Me	1.7
-CN	0.2	-Et	1.8
-Cl	0.5	-CHMe ₂	2.2
-Br	0.5	-C ₆ H ₅	2.9
-OMe	0.6	-CMe ₃	5.4
-OH	0.9		

1) (18 points) For reactions (a) - (g) (this page and top of next), provide one of three responses in the box:

OK if the reaction is correct as written

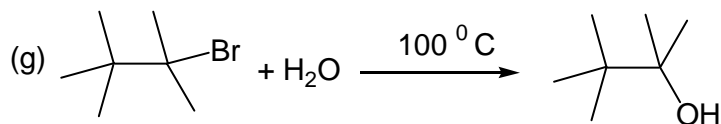
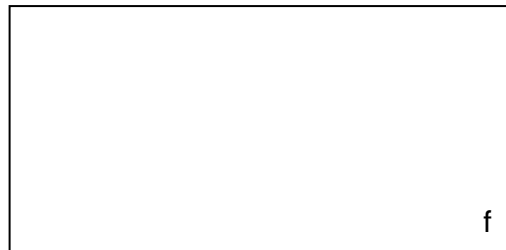
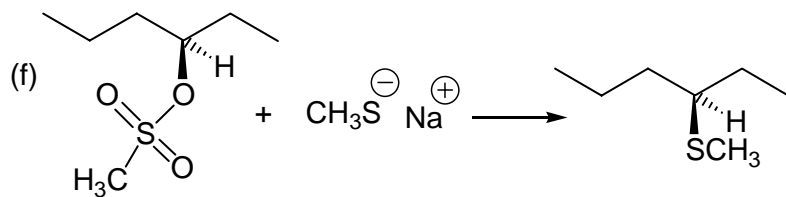
NoReaction if the indicated reaction is wrong and NO REACTION WILL OCCUR

Provide the **structure of the correct product** if the indicated product is incorrect. **Cross out the incorrect structure**

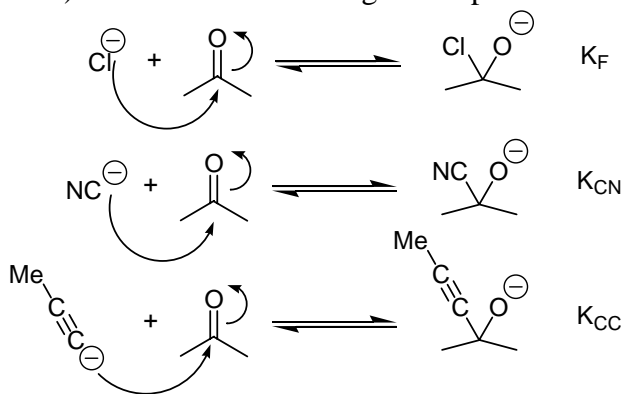


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2. (7 points) Consider the following nucleophilic addition reactions to 2-propanone.



(a) (2 points) Rank the three equilibrium constants from LARGEST (most product) to SMALLEST.

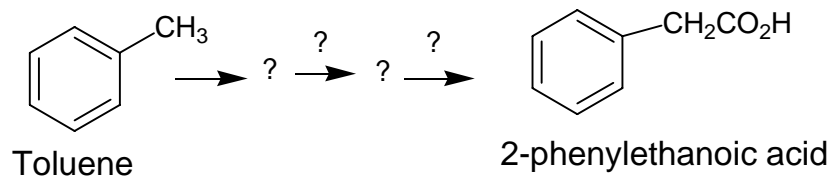
$K_{\text{CC}} > K_{\text{CN}} > K_{\text{F}}$

(b) (5 points) Explain your equilibrium constant ranking. Remember, equilibrium constant is a thermodynamic quantity.

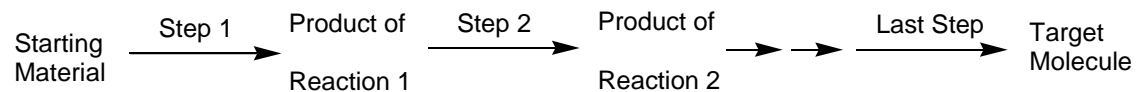
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3. (10 points) Starting with toluene, provide a synthesis of 2-phenylethanoic acid (target molecule).
You may use any reagents described in class or in Chapters 1 - 9.



A properly constructed answer consists of reagents / conditions for each step and the product molecule isolated from that step.

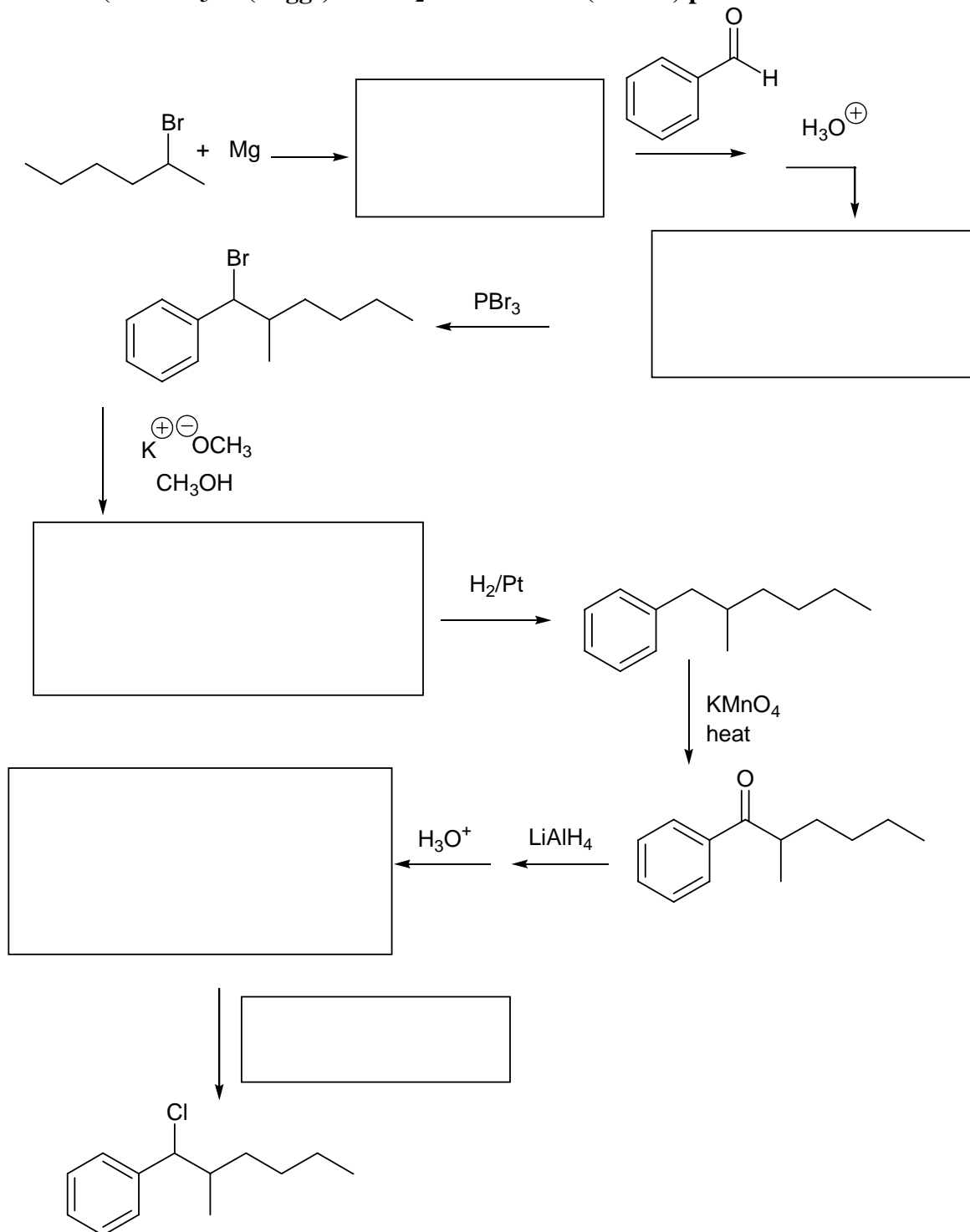


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4) (15 points) **Fill in the boxes with the appropriate organic structure or reagent.** This synthesis includes some transformations that are new to you. These reactions are correct. You only need to provide information indicated by the boxes. You can ignore stereochemistry for the reactions in this problem.

(Note: H_3O^+ (Suggs) and H_2O / HX dilute (Zimmt) perform the same function.)



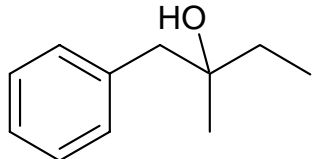
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5) (12 points) Retrosynthesis

(a) 2-butanol is a four-carbon secondary alcohol. Give the structures of a two carbon aldehyde and two carbon lithium reagent that would react to give 2-butanol (after reaction workup).

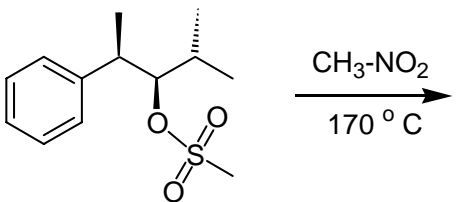
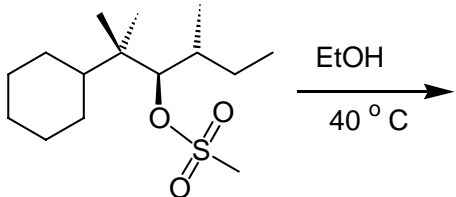
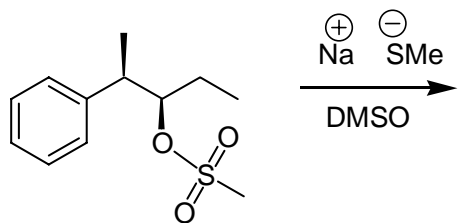
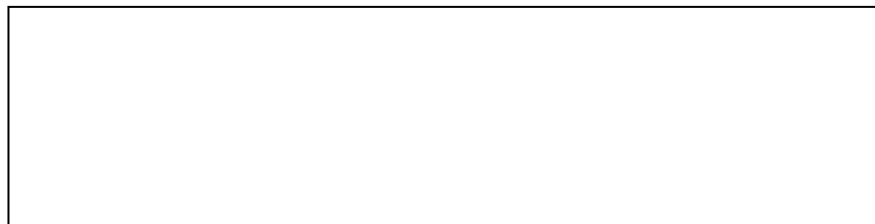
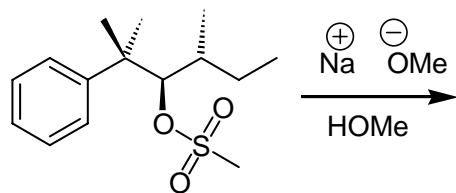
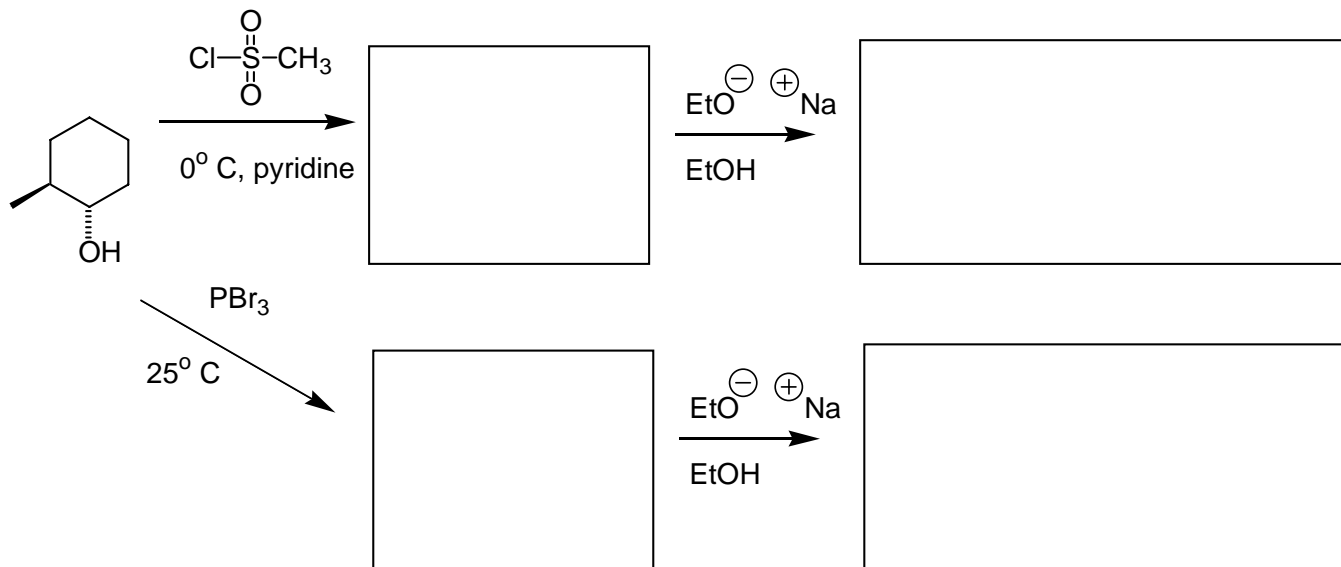
(b) 1-hexanol is a six carbon primary alcohol. Give the structures of an aldehyde and a lithium reagent that would react to give 1-hexanol (after reaction workup).

(c)  2-methyl-1-phenyl-2-butanol is an 11 carbon tertiary alcohol. Provide **two different** reactions (Grignard reagent plus Ketone or Aldehyde) that give this 11 carbon alcohol (after reaction workup).

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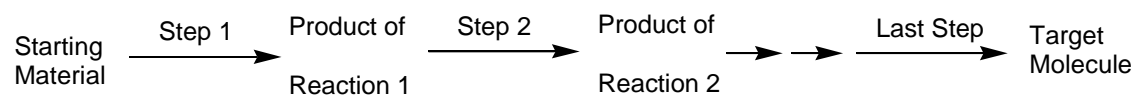
6) (18 points) Provide the products of the following reaction.



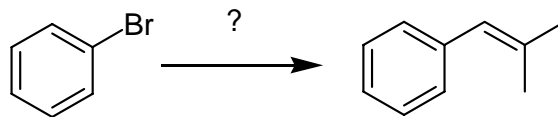
Name _____

SISD _____

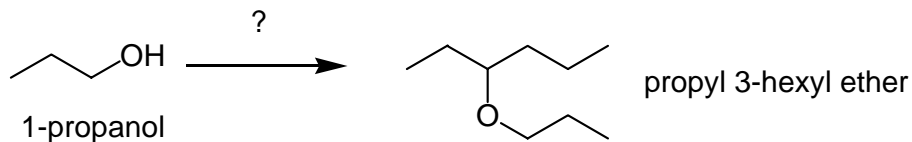
7) (20 points) Provide syntheses of the following **Target Molecule** starting from the indicated **Starting Material**. A properly constructed answer consists of reagents / conditions for each step and the product molecule isolated from that step.



(a) (8 points) Your answer must use bromobenzene and any other required organic or inorganic molecules.



(b) (12 points) All 9 carbons in the final product (propyl 3-hexyl ether) must derive from the starting material (1-propanol, 3 carbons). You can use 1-propanol as the starting material for as many reaction as you need. (convergent synthesis).



Name_____

SISD_____

Scratch work - will not be graded.

Name_____

SISD_____

Scratch work - will not be grade.