EXAMINATION 2

Chemistry 3A
Professor Carolyn Bertozzi
Professor Peter Vollhardt
November 5, 1996

Name: _____
(PRINT First name first, then Last name. Use capital letters!)

Please check the name of your TA and corresponding section number. Complete the remaining information if applicable.

161	Baryza,Jeremy	_____	311	Adronov,Alex	_____
111	Goon,Scarlett	_____	321	Mullins,Sarah	_____
121	Yeston,Jake	_____	331	Esker,Todd	_____
131	Gruneich,Jeffrey	_____	341	Shaffer,Wendy	_____
141	Richards,Steven	_____	351	Loftus,Christine	_____
151	Berglund,Timna	_____	411	Lemieux,George	_____
211	Thornton,Joel	_____	421	Essy,Blair	_____
221	Moore;Jennifer	_____	511	Staunton,Joanna	_____
361	Paisner,Sara	_____	521	Magliery,Thomas	_____
371	Tellers,David	_____	531	Marcordes,Belinda	_____

Making up an I-grade_____
(If you are, please indicate the semester during which you took Chem 3A previously_____.)

Please write the answers you want graded in the spaces provided. Do scratch work on the backs of the pages. This test should have 14 numbered pages. Check to make sure that you have received a complete exam. A good piece of advice: **read carefully over the questions at least twice; make sure that you understand exactly what is being asked; avoid sloppy structures or phrases. It is better to be pedantic in accuracy! Good Luck!**

DO NOT WRITE IN THIS SPACE

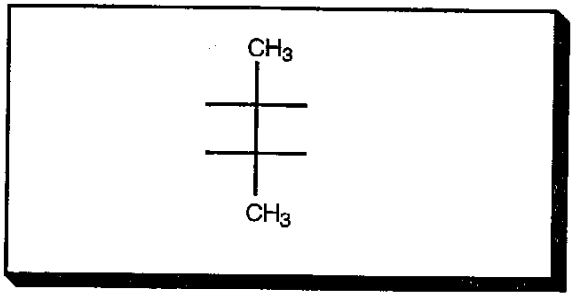
		I.	_____(15)		
		II.	_____(10)	VIa.	_____
		III.	_____(60)	VIb.	_____
		IV.	_____(35)	VIc.	_____
Va.	_____	V.	_____(40)	VId.	_____
Vb.	_____	VI.	_____(40)	VIe.	_____
Total	_____			Total	_____
		Total	_____(200)		

I. [15 Points]

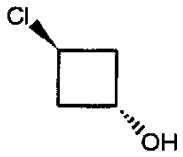
Name or draw, as appropriate, the following molecules according to the IUPAC rules. Indicate stereochemistry where necessary (cis, trans, R, S, or meso).

a.

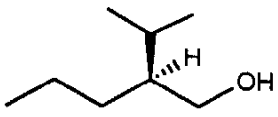
(2R,3S)-2-chloro-3-iodobutane



b.

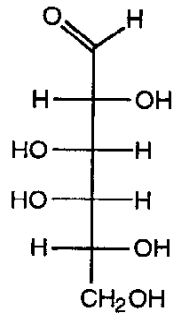


c.

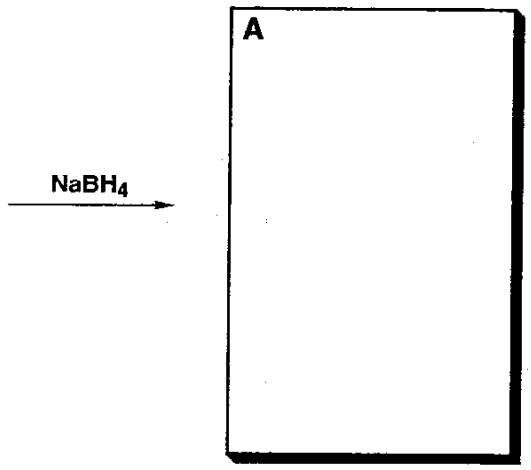


II. [10 points]

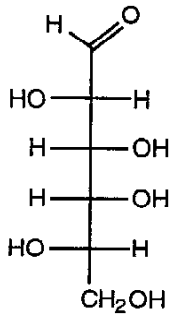
a. The reduction of (+)-galactose with $NaBH_4$ gives a product A and the reduction of (-)-galactose gives a product B. Draw the structures of A and B in the boxes provided. Are these products optically active or inactive (circle one)?



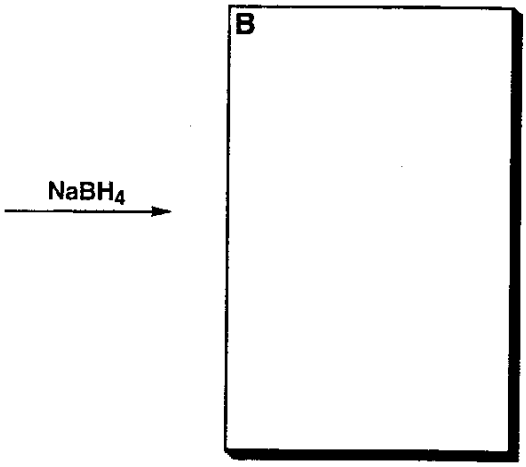
(+)-galactose



active inactive



(-)-galactose



active inactive

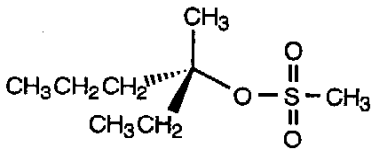
b. What is the relationship between A and B? (Circle one answer)

enantiomers diastereomers constitutional isomers identical

III. [60 points]

Add the missing starting materials, reagents, or products (aqueous work-up is assumed where necessary). Don't forget stereochemistry!

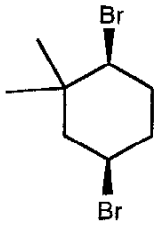
a.



CH_3CH_2OH
(solvent)
0 °C

Circle one: optically active? yes no

b.



CH_3S^-
(1 equiv)
Acetone

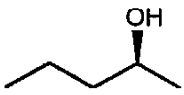
optically active? yes no

c.

NaH

optically active? yes no

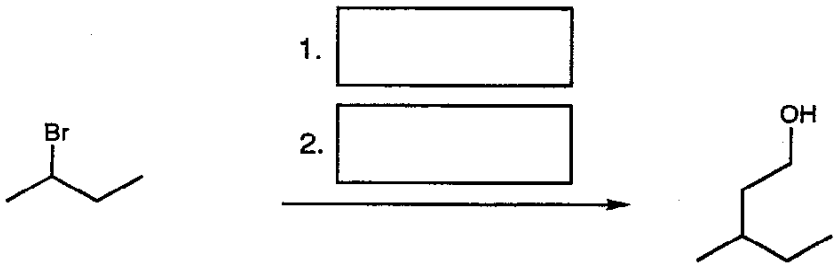
d.



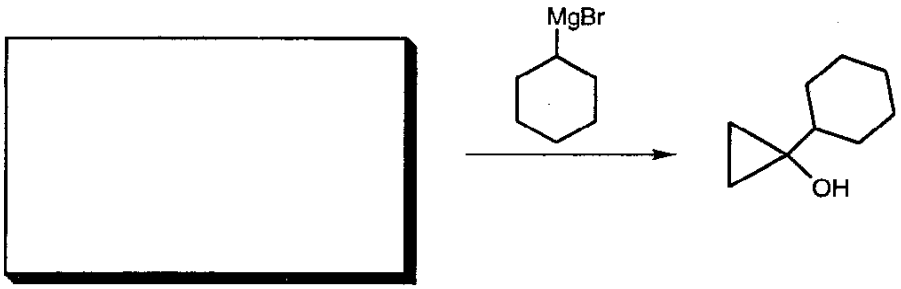
1. $Na_2Cr_2O_7$, H_2O, H_2SO_4
2. CH_3MgBr

optically active? yes no

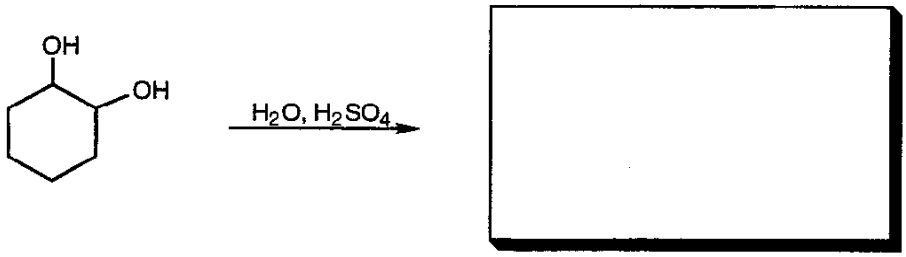
e.



f.

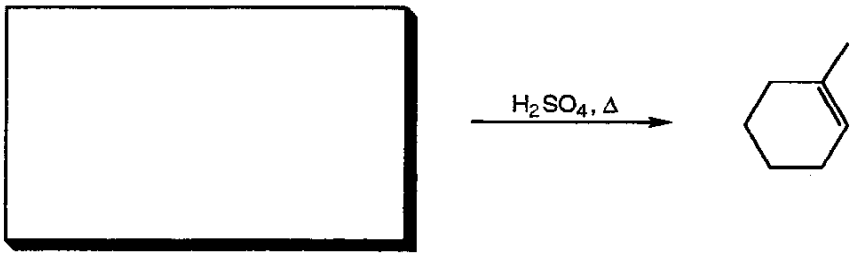


g.



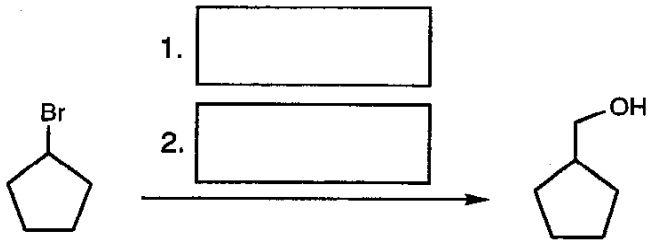
$C_6H_{10}O$

h.

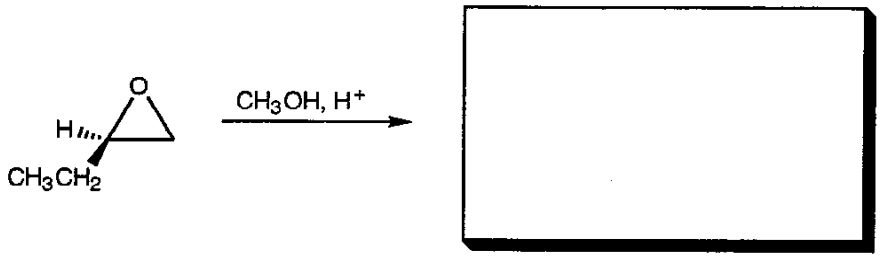


a tertiary alcohol

i.



j.

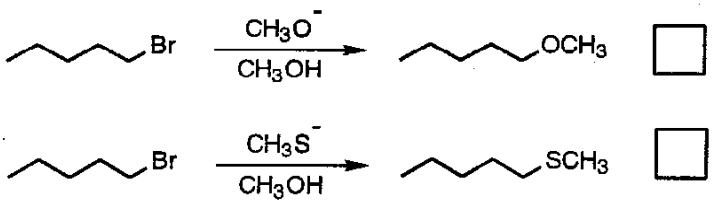


Optically active? Yes No

IV. [35 points]

For each pair of reactions shown below, mark the box on the right with an "X" indicating which will go faster and circle the mechanism by which it proceeds (e.g., S_N2, S_N1, E2, E1). Below, circle the letter corresponding to the statement that best explains your choice. ***No credit will be given for a correct answer in the first part of the question with an incorrect reason in the last part.***

a.



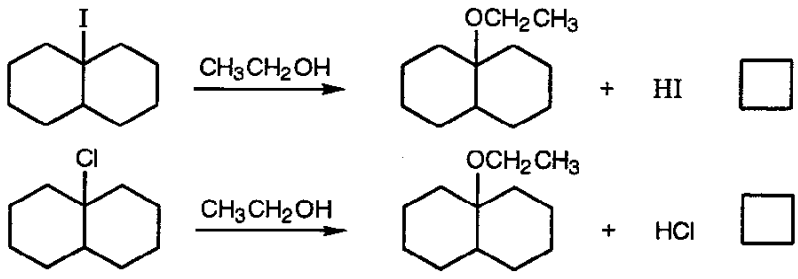
S_N2 S_N1 E2 E1

a. CH_3O^- is a stronger base than CH_3S^-.

b. CH_3S^- is less solvated and more polarizable than CH_3O^-

c. The S-H bond is weaker than the O-H bond.

b.



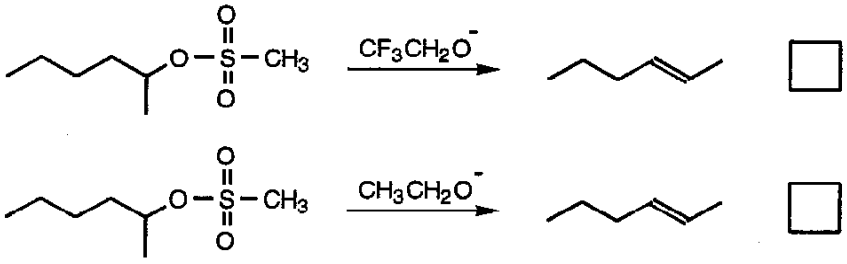
S_N2 S_N1 E2 E1

a. I^- is a weaker base than Cl^-.

b. I^- is a better nucleophile than Cl^-.

c. Ethanol is a better nucleophile than I^-.

c.



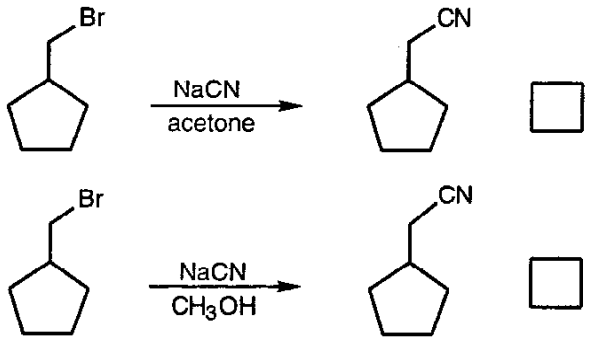
S_N2 S_N1 E2 E1

a. $CH_3CH_2O^-$ is a better nucleophile than $CF_3CH_2O^-$.

b. $CH_3CH_2O^-$ is a stronger base than $CF_3CH_2O^-$.

c. $CH_3CH_2O^-$ is a weaker base than $CF_3CH_2O^-$.

d.



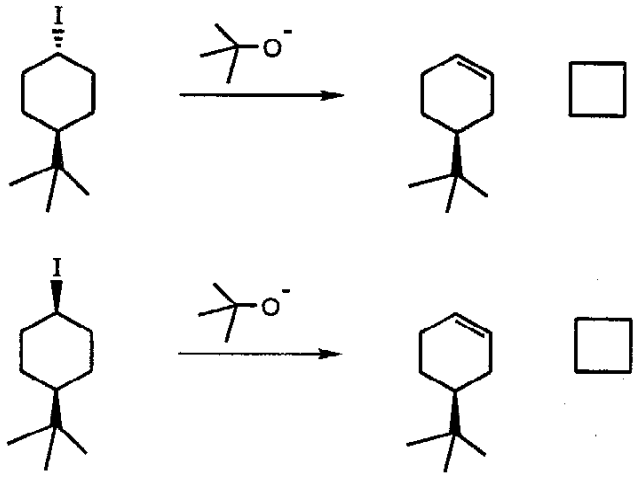
S_N2 S_N1 E2 E1

a. Carbocations are more stable in polar solvents.

b. CH_3OH is a weak base.

c. Anions are encumbered by solvation in protic solvents.

e.



S_N2 S_N1 E2 E1

a. The E1 reaction proceeds through a planar carbocation.

b. The nucleophile in the S_N2 reaction attacks from the backside.

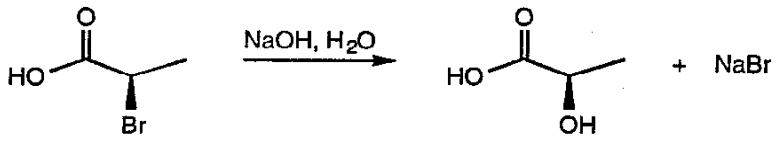
c. The base in the E2 reaction attacks the proton anti to the leaving group.

Hint: Draw the chair conformers of the starting materials

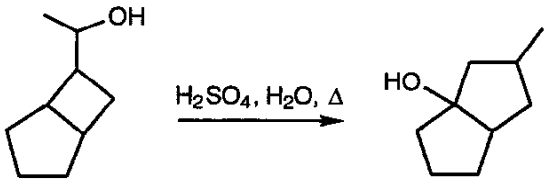
V. [40 points]

Explain the following observations by a detailed mechanism (i.e., write a scheme with structures, use arrow-pushing to illustrate the flow of electrons, etc.).

a.



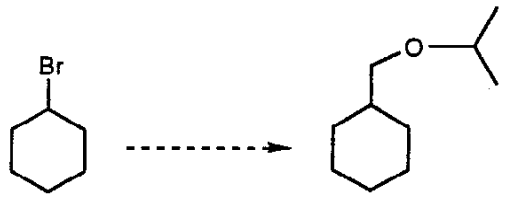
b.



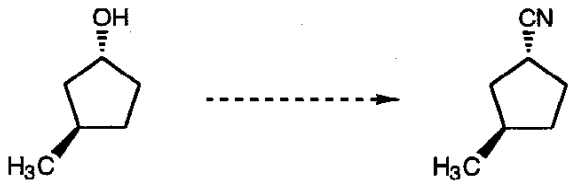
VI. [40 points]

Provide a viable synthetic route from starting material to product. You may use any additional organic or inorganic compounds in your scheme.

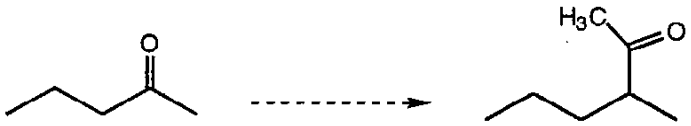
a.



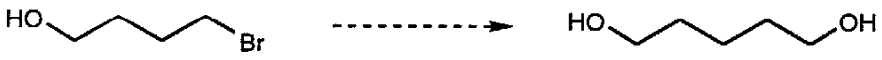
b.

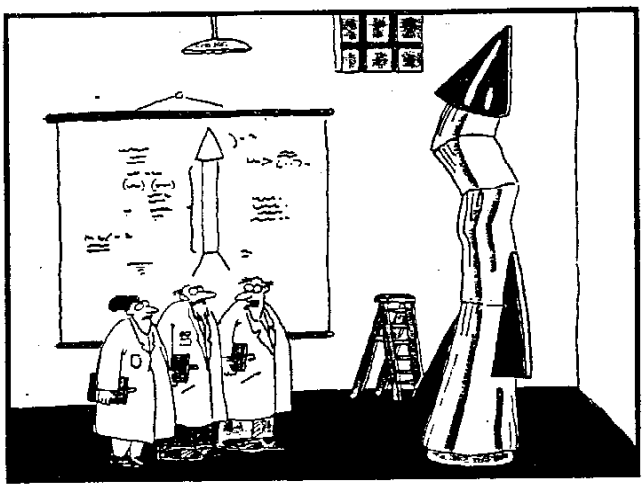


c.



d.





"It's time we face reality, my friends. ...
We're not exactly rocket scientists."

THE END