Name (First, MI, Last):
Student ID Number:
Circle the name of your TA: AL CARI ROB
Discussion Section – Day: Time:

Chem 30B Fall 2003

MIDTERM #2

(50 Min)

Monday November 17th

Q1	**/ 24**	**Q5**	**/ 12**
Q2	**/ 18**	**Q6**	**/ 14**
Q3	**/ 16**	**Extra Credit**	**/ 10**
Q4	**/ 16**	**Total**	**/ 100**

******DO NOT OPEN THIS EXAM UNTIL INSTRUCTED TO DO SO******

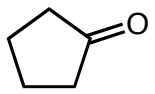
ONLY ANSWERS WRITTEN IN THE BOXES PROVIDED WILL BE GRADED

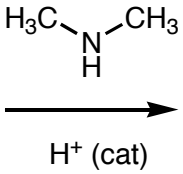
INTERPRETATION OF THE QUESTIONS IS PART OF THE EXAM – DO NOT ASK FOR THE QUESTIONS TO BE EXPLAINED TO YOU

"*He who asks is a fool for five minutes, but he who does not ask remains a fool forever*" – Chinese Proverb

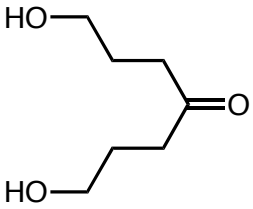
Question 1 Each of these reactions produces ONE MAJOR PRODUCT. In each case, draw this product (including appropriate stereochemistry where relevant) in the box provided. For multi-step reactions just give the FINAL product, *i.e.*, no intermediates. (2 points each)

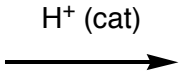
(a)



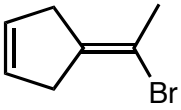


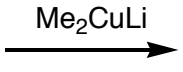
(b)





(c)





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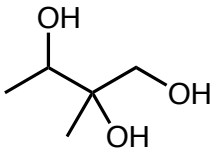
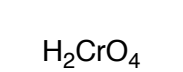
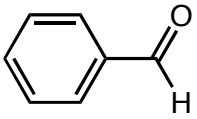
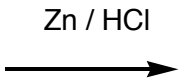




(e)





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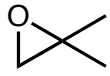
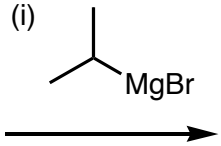
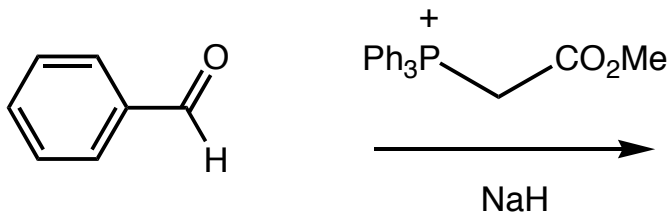


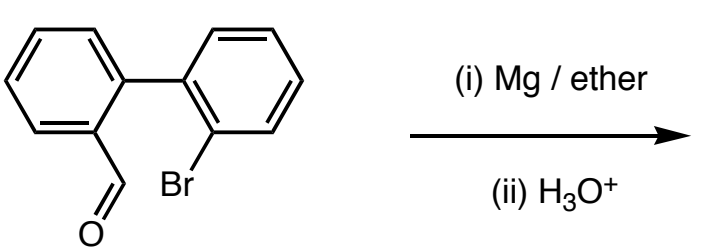


Question 1 continued on next page...

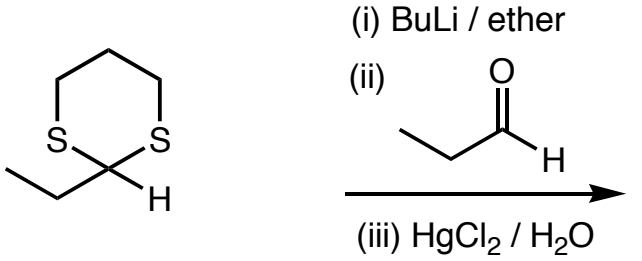
(g)


O
H
+
Ph3P
CO2Me
NaH

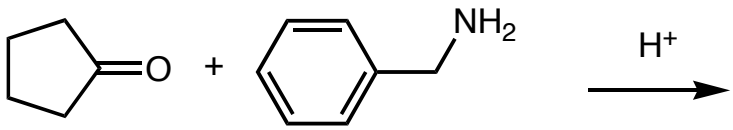
(h)


Br
O
(i) Mg / ether
(ii) H3O+

(i)


S
S
H
(i) BuLi / ether
(ii)
O
H
(iii) HgCl2 / H2O

(j)


O
+
NH2
H+

(k)

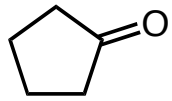

O
H2 / Pt

(l)


Br
(i) Mg / ether
(ii) CO2
(iii) H3O+

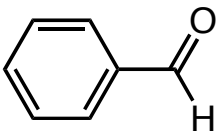
Question 2 Deuterium (D) is a heavier isotope of hydrogen (H). Chemical reagents in which certain H atoms have been replaced by D are used to perform reactions in which the products are isotopically labeled. For each of the reactions below, draw the structure of the final product, CAREFULLY INDICATING the position of the D atoms in the products. (3 points each)

(a)



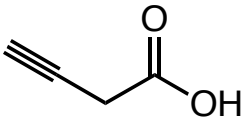
$\xrightarrow[D_2O]{Zn\ /\ DCl}$

(b)



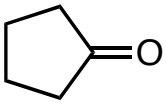
$\xrightarrow[(ii)\ H_2O]{(i)\ NaBD_4}$

(c)



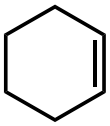
$\xrightarrow[(ii)\ H_2O]{(i)\ LiAlD_4}$

(d)



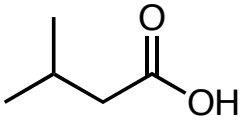
$\xrightarrow[NaH]{+\ Ph_3P{-}CD_3}$

(e)



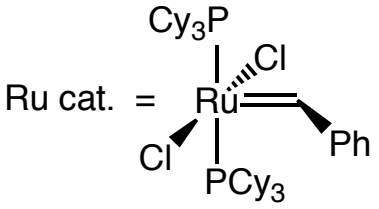
$\xrightarrow[Zn/Cu]{CD_2I_2}$

(f)

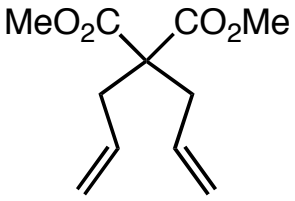


$\xrightarrow[ether]{CD_2N_2}$

Question 3 Each of these Ring Closing Metathesis (RCM) reactions produces ONE MAJOR ORGANIC PRODUCT as well as ethylene (C_2H_4). In each case, draw this product in the box provided. (4 points each)

Ru cat. = 

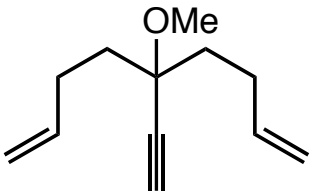
(a)



Ru cat. →

+ $H_2C{=}CH_2$

(b)



Ru cat. →

Hint: Product does not contain a C≡C bond

+ $H_2C{=}CH_2$

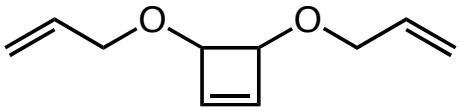
(c)

Ru cat. →

Hint: Product does not contain a C≡C bond

+ $H_2C{=}CH_2$

(d)



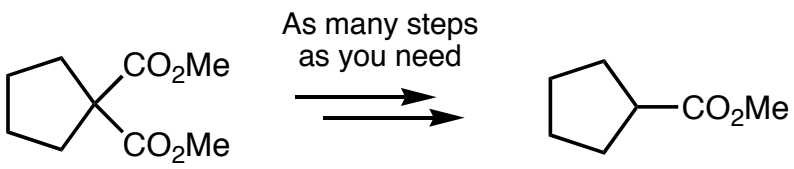
Ru cat. →

Hint: Product does not contain a 4-membered ring

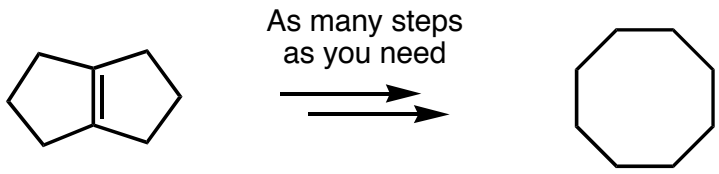
+ $H_2C{=}CH_2$

Question 4 Propose a synthesis for each of the transformations shown below, include all intermediates, in addition to conditions and reagents for each synthetic step – do not worry about solvents. (8 points each)

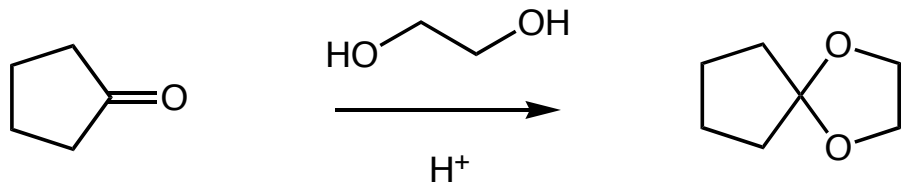
(a)



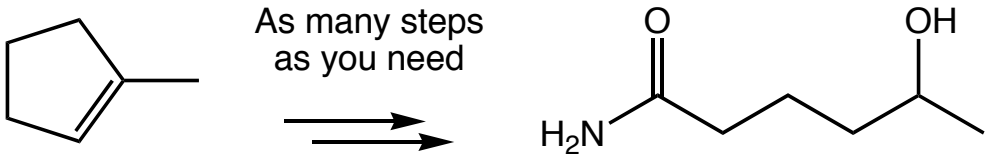
(b)



Question 5 Propose a reasonable mechanism that accounts for the transformation shown in the box below – SHOW ALL STEPS. (12 points)



Question 6 Propose a synthesis to convert 1-methylcyclopentene into the acyclic hydroxy-amide compound shown below. Show all intermediates, and the reagents necessary for each step (do not concern yourself with solvents). Points will be deducted for syntheses that result in a mixture of compounds – other than a racemic mixture of the target molecule. (14 points)



EXTRA CREDIT Propose a synthesis of the bow tie-shaped molecule below, starting with vinyl bromide. You may use any other reagents of your choosing, each of which must contain NO MORE THAN ONE CARBON ATOM (they may have as many other non-C atoms as you wish). (10 points) – Note: as this is an extra credit problem, grading will be very strict.