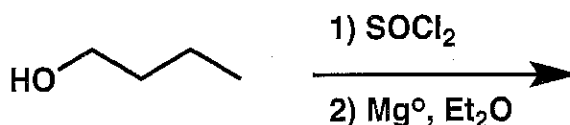


General Instructions:

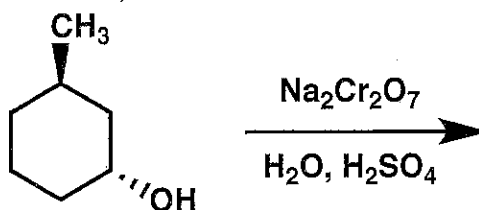
- (i) Use scratch paper at the back of the exam to work out answers; final answers must be recorded at the proper place on the exam itself for credit. Models are allowed.
- (ii) Print your name on each page.
- (iii) Please keep your paper covered and your eyes on your own work. Misconduct will lead to failure in the course.

1. (17 points) Show the major product(s) expected from the reactions below.

(a)

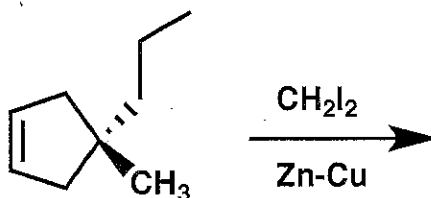


(b)



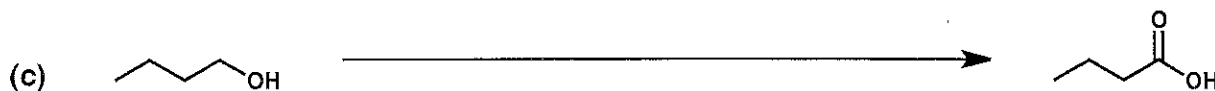
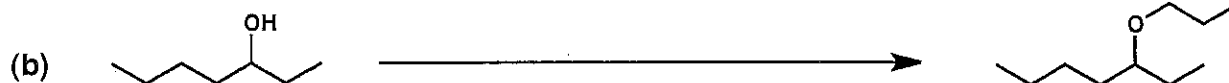
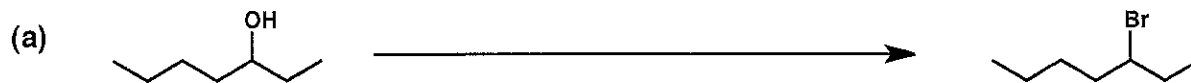
(single enantiomer)

(c)

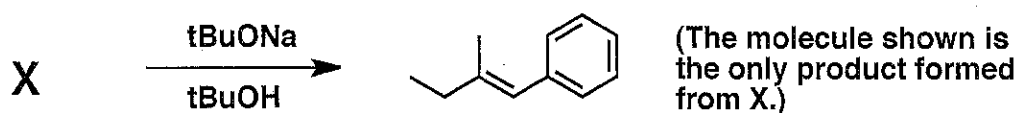


Name _____

2. (20 points) Show the reagents required to convert the starting molecule to the indicated product. If necessary, be sure to differentiate clearly between distinct steps, by using "1)", "2)", etc. over the arrow.

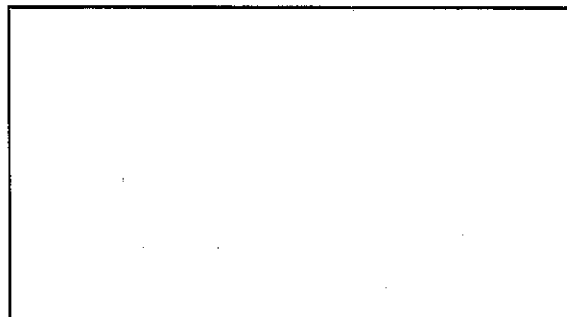


3. (6 points) Draw the structure of molecule X in the box, based on the result of the reaction indicated below.



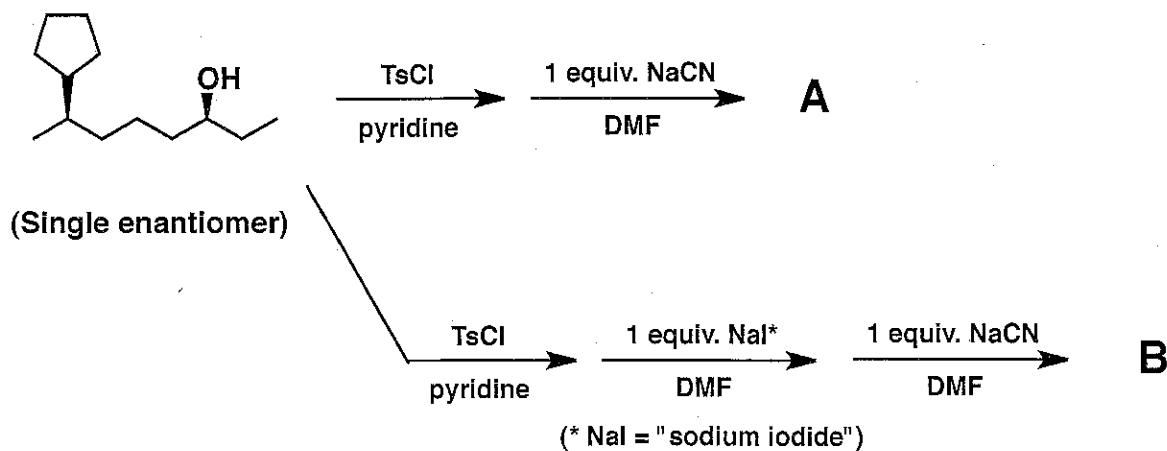
(C₁₁H₁₅Br)

X =

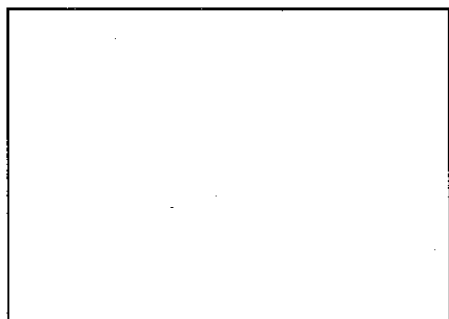


4. (14 points)

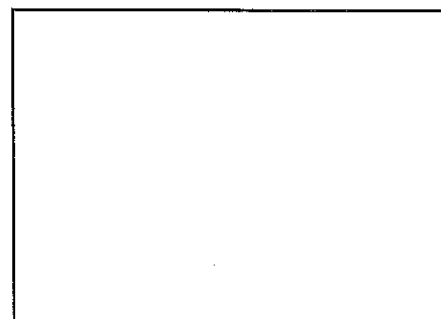
(a) Draw the structures of molecules A and B in the appropriate boxes. A and B are isomers.



A =



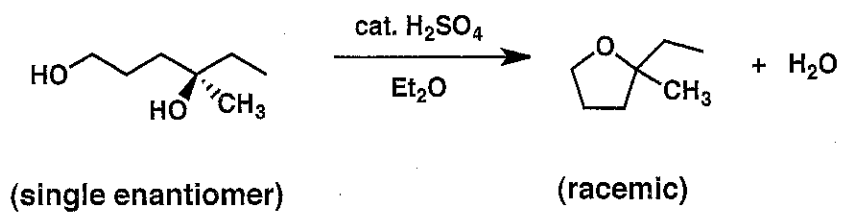
B =



(b) Please fill in the blank: Isomeric relationship between A and B = _____

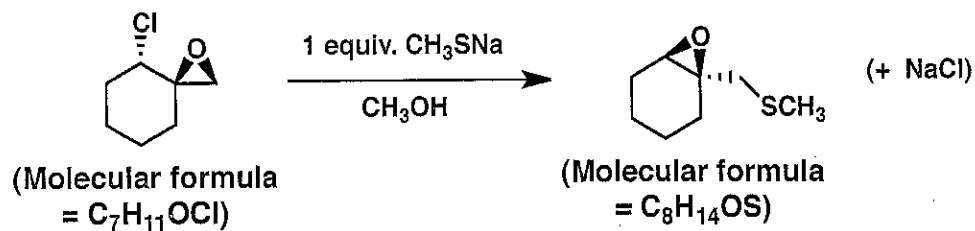
Name _____

5. (14 points) Provide a mechanism (curved arrows) for the reaction below. Your mechanism must account for the stereochemical aspects of the reaction.

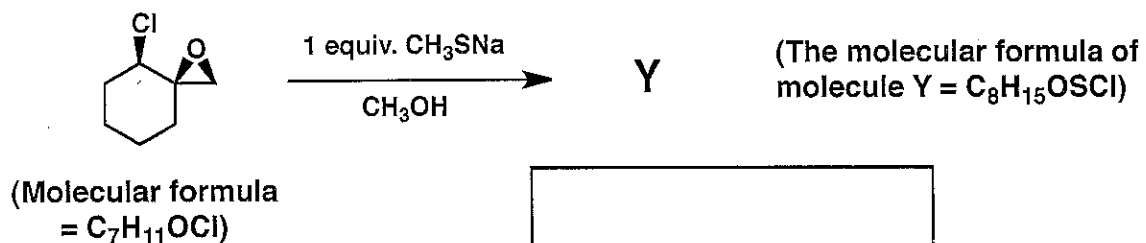


6. (16 points)

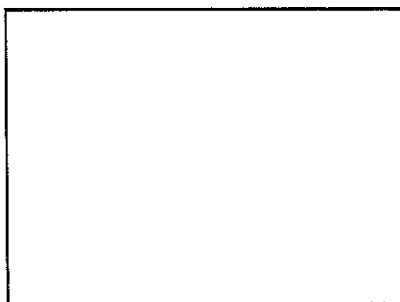
(a) Provide a mechanism (curved arrows) for the reaction below.



(b) Indicate the structure of molecule Y in the box based on the information given below.



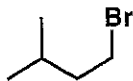
Y =

(c) Briefly (no more than two sentences) explain why molecule Y retains a chlorine atom but the product of the reaction shown in part (a) does not.

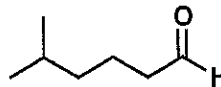
Name _____

7. (13 points) Suggest a synthetic route (i.e., a specific sequence of reactions) that would be expected to produce the "target" molecule from the indicated starting material. You may use any reagents in your proposed route. Try to reach the target with the fewest possible reactions, and try to choose reactions that are as selective as possible for one target (rather than a mixture of targets).

Starting Material



Target



Name _____

<u>Problem #</u>	<u>Score</u>
1	/ 17
2	/ 20
3	/ 6
4	/ 14
5	/ 14
6	/ 16
7	/ 13

Total:

/ 100

Periodic Table of the Elements

		<div style="border: 1px solid black; padding: 5px; display: inline-block;"> ¹H 1.008 </div>												<div style="border: 1px solid black; padding: 5px; display: inline-block;"> ²He 4.003 </div>									
³ Li 6.94	⁴ Be 9.01											⁵ B 10.81	⁶ C 12.011	⁷ N 14.01	⁸ O 16.00	⁹ F 19.00	¹⁰ Ne 20.18						
¹¹ Na 22.99	¹² Mg 24.31											¹³ Al 26.98	¹⁴ Si 28.09	¹⁵ P 30.97	¹⁶ S 32.06	¹⁷ Cl 35.45	¹⁸ Ar 39.95						
¹⁹ K 39.10	²⁰ Ca 40.08	²¹ Sc 44.96	²² Ti 47.90	²³ V 50.94	²⁴ Cr 52.00	²⁵ Mn 54.94	²⁶ Fe 55.85	²⁷ Co 58.93	²⁸ Ni 58.71	²⁹ Cu 63.55	³⁰ Zn 65.37	³¹ Ga 69.72	³² Ge 72.59	³³ As 74.92	³⁴ Se 78.96	³⁵ Br 79.90	³⁶ Kr 83.80						
³⁷ Rb 85.47	³⁸ Sr 87.62	³⁹ Y 88.91	⁴⁰ Zr 91.22	⁴¹ Nb 92.91	⁴² Mo 95.94	⁴³ Tc 98.91	⁴⁴ Ru 101.07	⁴⁵ Rh 102.91	⁴⁶ Pd 106.4	⁴⁷ Ag 107.87	⁴⁸ Cd 112.40	⁴⁹ In 114.82	⁵⁰ Sn 118.69	⁵¹ Sb 121.75	⁵² Te 127.60	⁵³ I 126.90	⁵⁴ Xe 131.30						
⁵⁵ Cs 132.91	⁵⁶ Ba 137.34	⁵⁷ La 138.91	⁷² Hf 178.49	⁷³ Ta 180.95	⁷⁴ W 183.85	⁷⁵ Re 186.2	⁷⁶ Os 190.2	⁷⁷ Ir 192.2	⁷⁸ Pt 195.09	⁷⁹ Au 196.97	⁸⁰ Hg 200.59	⁸¹ Tl 204.37	⁸² Pb 207.19	⁸³ Bi 208.98	⁸⁴ Po (209)	⁸⁵ At (210)	⁸⁶ Rn (222)						
⁸⁷ Fr (223)	⁸⁸ Ra (226.03)	⁸⁹ Ac (227)	¹⁰⁴ Unq* (261)	¹⁰⁵ Uup* (262)	¹⁰⁶ Uuh* (263)	¹⁰⁷ Uns* (262)	¹⁰⁸ Uno* (265)	¹⁰⁹ Uua* (266)															

Lanthanides

⁵⁸ Ce 140.12	⁵⁹ Pr 140.91	⁶⁰ Nd 144.24	⁶¹ Pm (145)	⁶² Sm 150.35	⁶³ Eu 151.96	⁶⁴ Gd 157.25	⁶⁵ Tb 158.93	⁶⁶ Dy 162.50	⁶⁷ Ho 164.93	⁶⁸ Er 167.26	⁶⁹ Tm 168.93	⁷⁰ Yb 173.04	⁷¹ Lu 174.97
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Actinides

⁹⁰ Th 232.04	⁹¹ Pa (231)	⁹² U 238.03	⁹³ Np (237)	⁹⁴ Pu (244)	⁹⁵ Am (243)	⁹⁶ Cm (247)	⁹⁷ Bk (249)	⁹⁸ Cf (249)	⁹⁹ Es (254)	¹⁰⁰ Fm (257)	¹⁰¹ Md (258)	¹⁰² No (259)	¹⁰³ Lr (260)
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*Symbol (and name) provisional.

Numbers in parentheses: available radioactive isotope of longest half-life.

