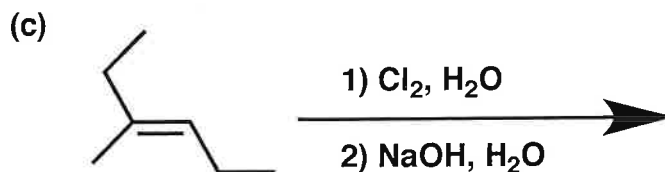
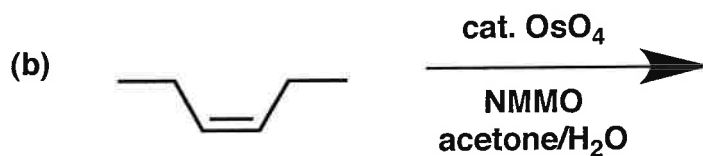


General Instructions:

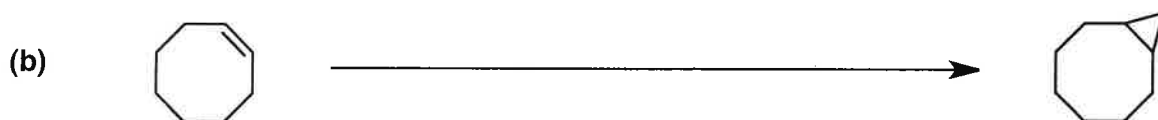
- (i) Use scratch paper at the back of the exam to work out answers; final answers must be recorded at the proper place on the exam itself for credit. Models are allowed.
- (ii) Print your name on each page.
- (iii) Please keep your paper covered and your eyes on your own work. Misconduct will lead to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

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



Name _____

2. (16 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.

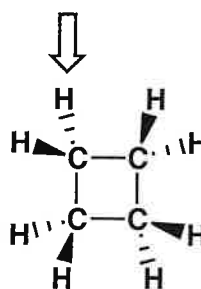
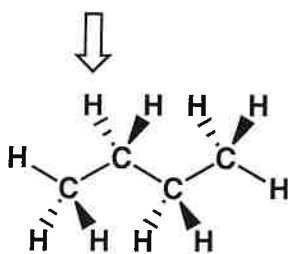


3. (10 points) For each molecule below, note the H atom indicated by the arrow. Relative to this H, indicate all appropriate other H's as described below.

Indicate each HOMOTOPIC H with a CIRCLE.

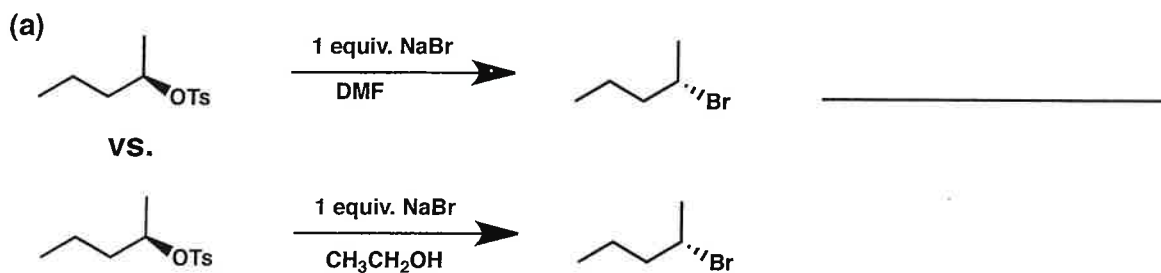
Indicate each ENANTIOTOPIC H with a TRIANGLE.

Indicate each DIASTEREOTOPIC H with a SQUARE.

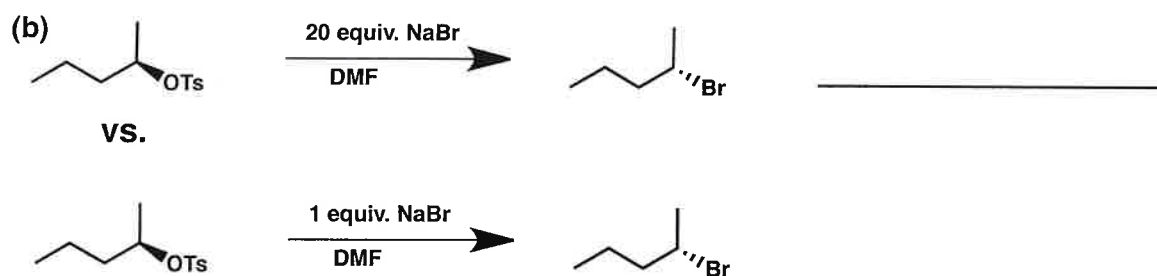


Name _____

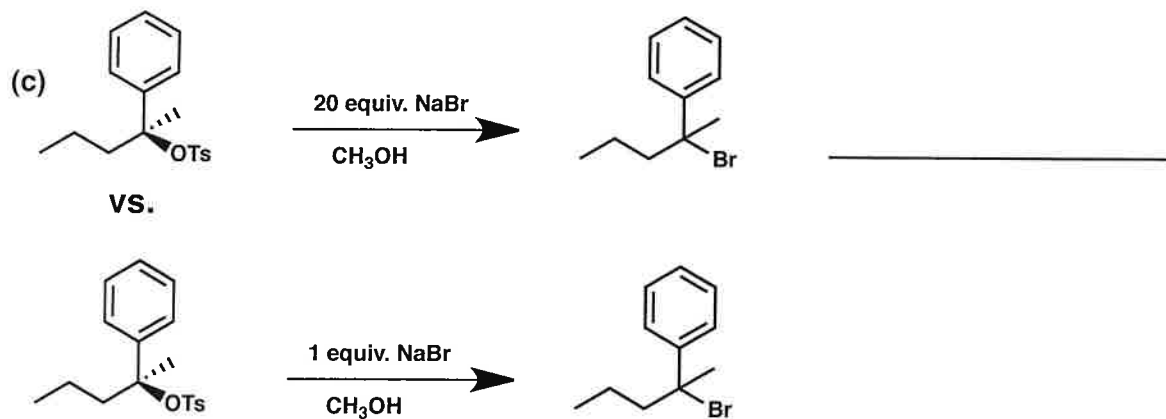
4. (9 points) For each pair of reactions shown below, write on the line whether the UPPER reaction is expected to be faster, slower or the same rate relative to the lower.



[Note: Starting material and product are single enantiomers.]

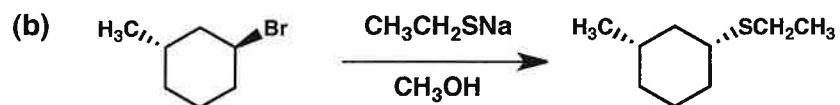
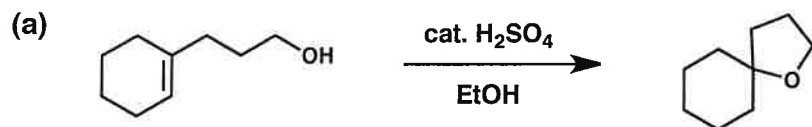


[Note: Starting material and product are single enantiomers.]



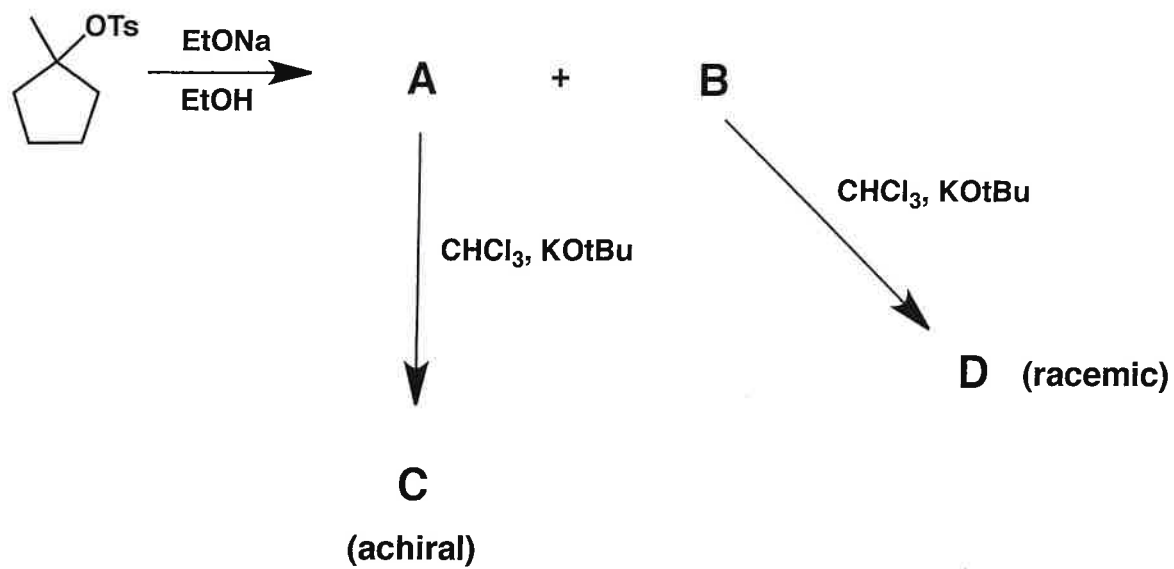
[Note: Starting material is a single enantiomer, product is racemic.]

5. (13 points) Provide a mechanism (curved arrows) for each reaction below.

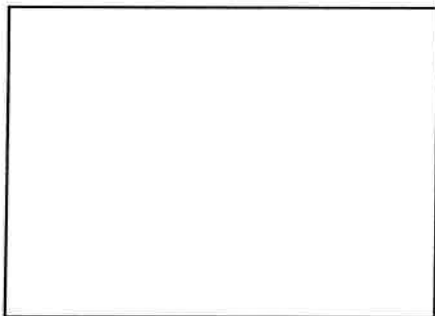


Name _____

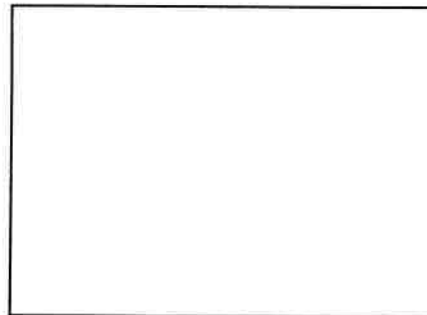
6. (20 points) Based on the information provided below, propose structures for molecules A, B, C and D (draw the structures in the appropriate boxes).



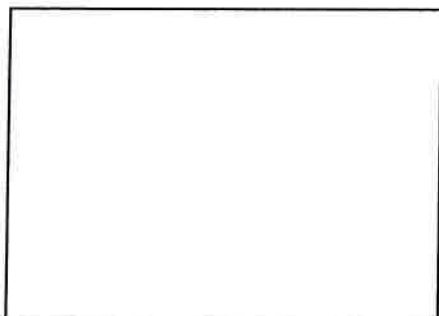
A =



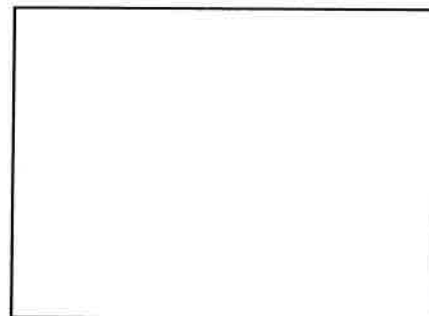
B =



C =



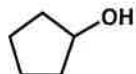
D =



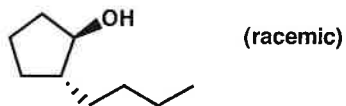
Name _____

7. (15 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	/ 16
3	/ 10
4	/ 9
5	/ 13
6	/ 20
7	/ 15

Total:**/ 100**

Periodic Table of the Elements

<table border="1" style="margin: auto;"> <tr> <td style="text-align: center;">1 H 1.008</td> </tr> </table>																		1 H 1.008	
1 H 1.008																			
3 Li 6.94	4 Be 9.01																	2 He 4.003	
11 Na 22.99	12 Mg 24.31																	9 F 19.00	10 Ne 20.18
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 Unp* (262)	106 Unh* (263)	107 Uns* (262)	108 Uno* (265)	109 Una* (266)											

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
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)

*Symbol (and name) provisional.

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

