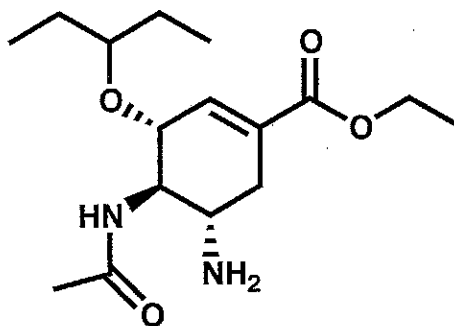


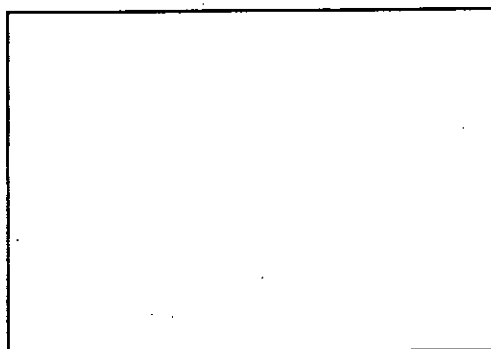
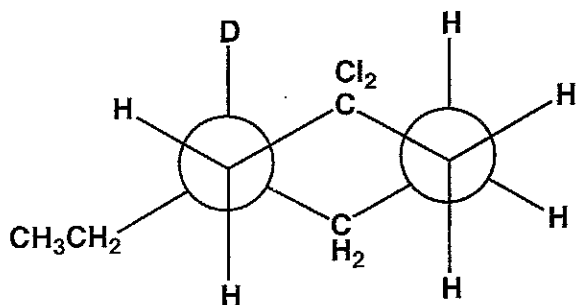
General Instructions:

- (i) Use scratch paper at back of exam to work out answers; final answers must be recorded at the proper place on the exam itself for credit.
- (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. (9 points) Shown below is the drug Oseltamir, which is used to treat influenza. CIRCLE each sp^3 stereogenic center (chiral center), and assign the configuration (R or S).



2. (23 points) Answer the questions pertaining to the Newman projection shown below.



(a) In the box, draw the "hexagon" version of this molecule, with wedges and dashes to show non-hydrogen substituent positions.

(b) Below, draw the chair conformation that corresponds to the Newman projection.

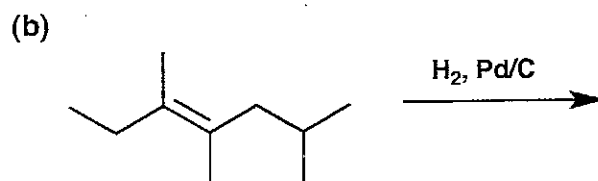
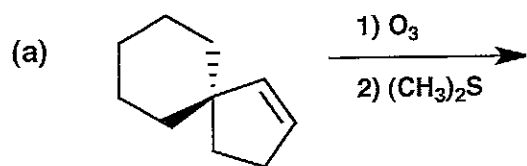
(c) Below, draw the other chair conformation available to this molecule.

(d) Is the conformation shown by the Newman projection above the most stable of the two possible conformations? (Circle the appropriate answer below.)

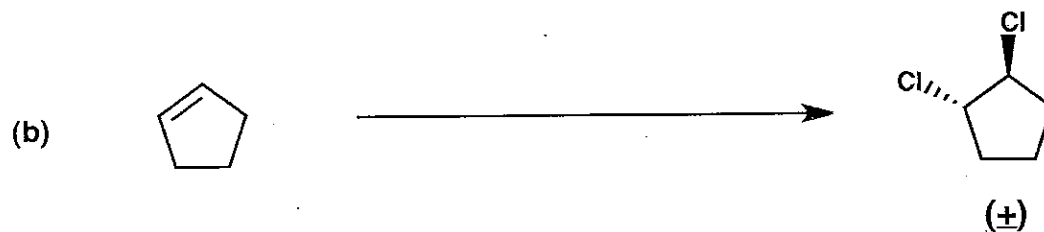
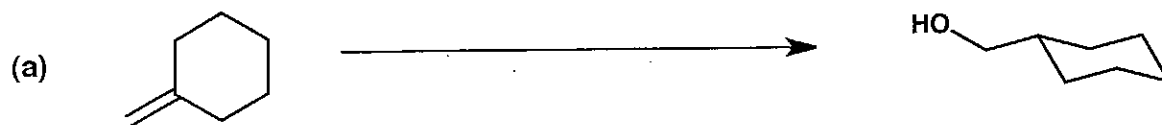
YES NO

(e) Draw a Newman projection from a perspective that shows that axial/equatorial positions of ALL of the non-hydrogen substituents on the ring.

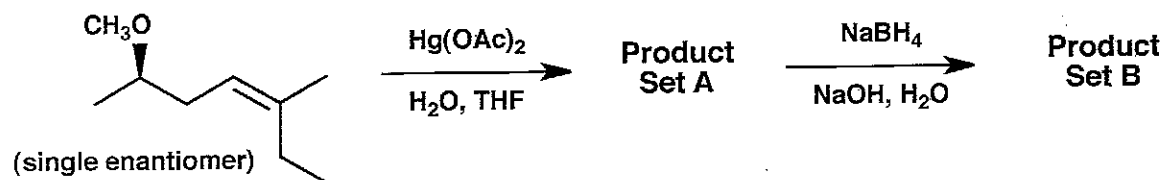
3. (14 points) Show the major product(s) expected from the reactions below.



4. (12 points) Show the reagents required to convert the starting molecule to the indicated product. If necessary, differentiate clearly between distinct steps by using "1)", "2)", etc. over or under the arrow.



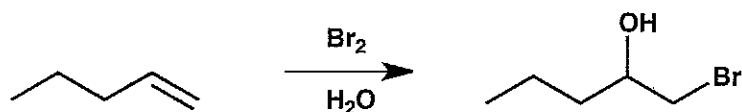
5. (20 points) Answer the questions pertaining to the reactions shown below.



(a) Draw ALL members of Product Set A. Draw a line between each pair of products and indicate the isomeric relationship for that pair.

(b) Draw ALL members of Product Set B. Draw a line between each pair of products and indicate the isomeric relationship for that pair.

6. (12 points) Draw a mechanism (curved arrows) for the reaction shown below. Be sure to draw all intermediates, and to indicate any by-products that may not be shown in the equation.



7. (10 points) Draw all achiral derivatives of n-pentane (i.e., unbranched carbon chain) that have the molecular formula $C_5H_{10}BrF$.

<u>Problem #</u>	<u>Score</u>
1	/ 9
2	/ 23
3	/ 14
4	/ 12
5	/ 20
6	/ 12
7	/ 10

Total: / 100

Periodic Table of the Elements

<div style="border: 1px solid black; padding: 5px; display: inline-block;"> ¹H 1.008 </div>																																			
³ Li 6.94	⁴ Be 9.01																	² He 4.003																	
¹¹ Na 22.99	¹² Mg 24.31																	⁵ B 10.81	⁶ C 12.011	⁷ N 14.01	⁸ O 16.00	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	¹³ Al 26.98	¹⁴ Si 28.09	¹⁵ P 30.97	¹⁶ S 32.06	¹⁷ Cl 35.45	¹⁸ Ar 39.95												
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 Ump* (262)	¹⁰⁶ Uuh* (263)	¹⁰⁷ Uns* (262)	¹⁰⁸ Uno* (265)	¹⁰⁹ Una* (266)																											

Lanthanides

Actinides

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.

