

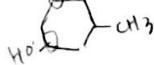
Chem 221001 Organic Chemistry

Exam 2

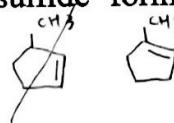
November 17, 2020

1. Which of the following compounds has a stereoisomer that is meso compound? Give the structure of the meso compound. (8%)

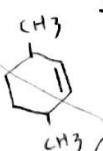
- (a) 2,3-dimethylhexane (b) 2,4-dibromo-3-methylpentane (c) 2,5-dichlorohexane
 (d) 1,3-dihydroxy-5-methylcyclohexane



2. Compound A with a molecular formula C_6H_{10} , contains three methylene units. A reacts with one equivalent of H_2 over Pd/C to yield B. A reacts with aqueous acid to form a single product C and undergoes hydroboration/oxidation to form a pair of enantiomers, D and E. Ozonolysis of A followed by reaction with dimethyl sulfide forms F with molecular formula $C_6H_{10}O_2$. Propose structures for A-F. (18%)

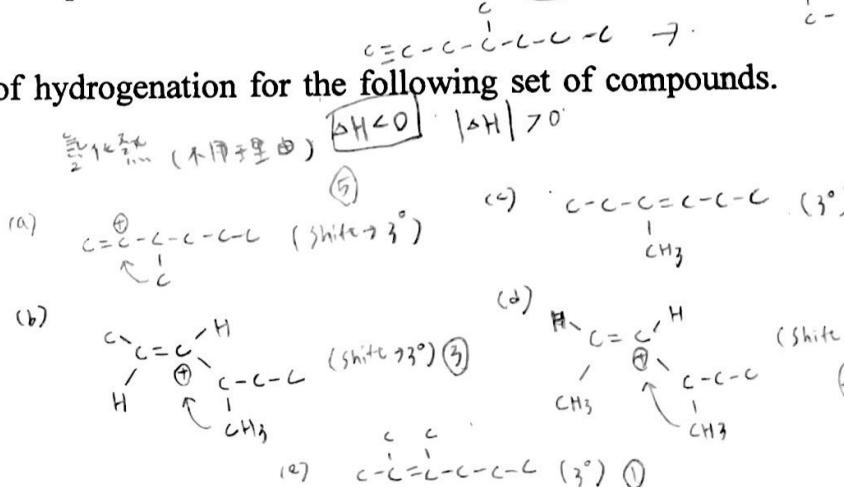


3. Draw the structure of a compound with molecular formula C_8H_{14} that reacts with excess of hydrogen over Pd/C to form a meso compound with molecular formula C_8H_{16} . (4%)

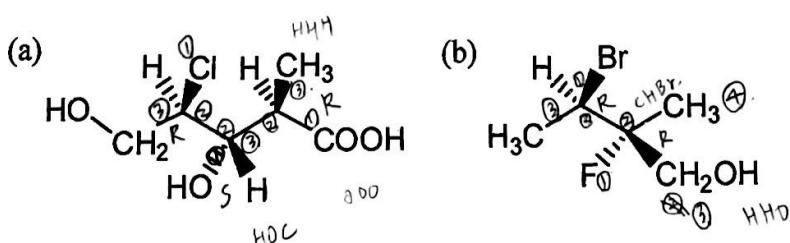


4. Give the order of decreasing heat of hydrogenation for the following set of compounds. (4%)

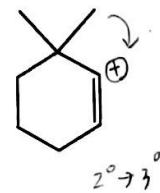
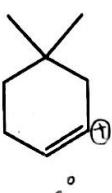
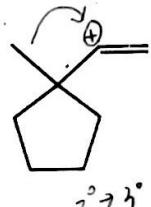
- (a) 3-methyl-1-hexene (b) (*E*)-4-methyl-2-hexene
 (c) 3-methyl-3-hexene (d) (*Z*)-4-methyl-2-hexene
 (e) 2,3-dimethyl-2-hexene



5. Convert the following perspective formulas to Fischer projections. Label each chiral carbon atom as (R) or (S). (14%)

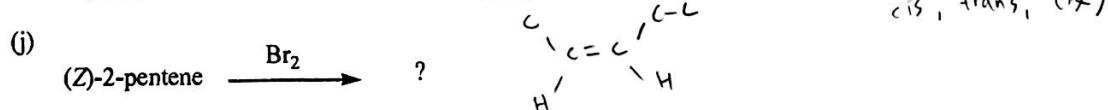
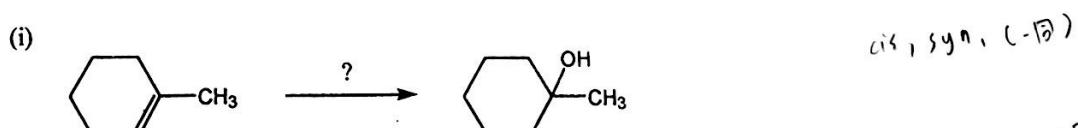
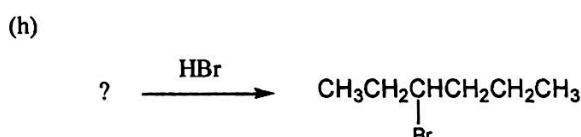
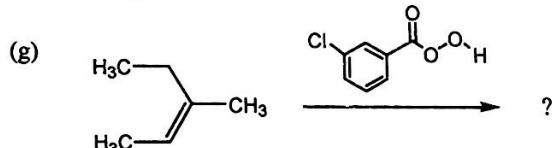
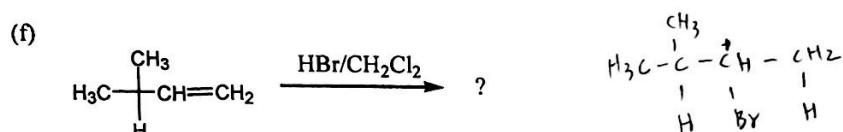
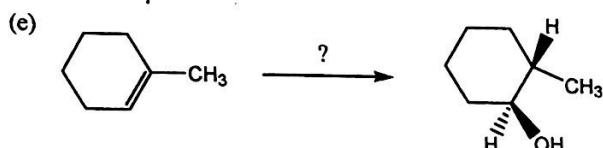
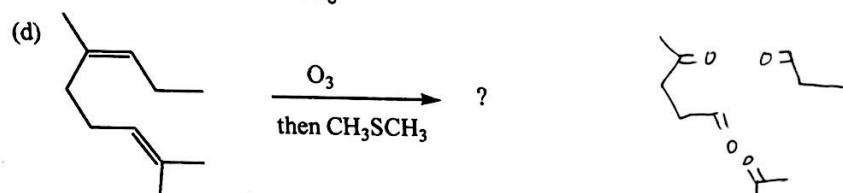
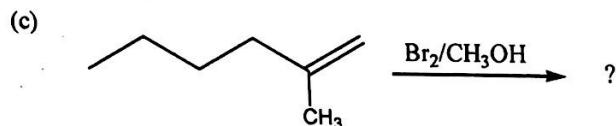
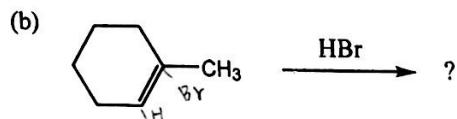
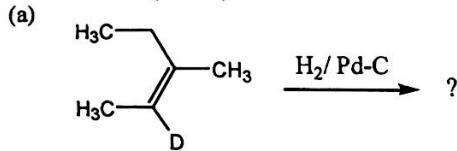


6. Which of the following compound(s) is/are likely to rearrange when react(s) with H_2O in the presence of H_2SO_4 ? Provide a brief reason for each case. (12%)



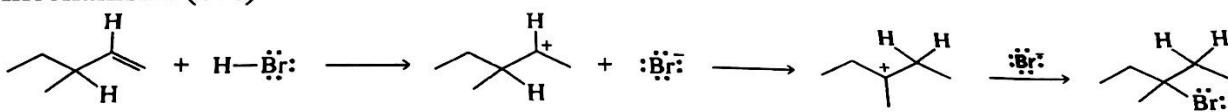
7. The specific rotation of (*S*)-2-bromobutane is +23.1. What is the composition of enantiomers in a sample of 2-bromobutane that has an observed specific rotation of -13.9? (4%)

8. Provide necessary reactant, reagent(s) or major product to complete each of the following reactions. (20%)



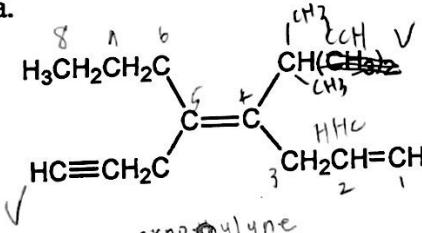
9. What is the equilibrium constant for a reaction that is carried out at 25 °C with $\Delta H^\circ = -20$ kcal/mol and $\Delta S^\circ = 5.0 \times 10^{-2}$ kcal/mol °K? Gas constant is 1.986 cal/mol °K. (3%)

10. Use curved arrows to show the flow of electrons that occurs in each step of the following mechanism. (6%)

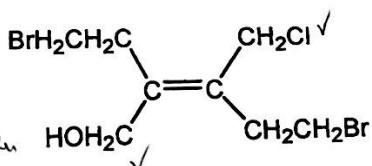


11. Give a systematic name for each of the following compounds. (6%)

a.

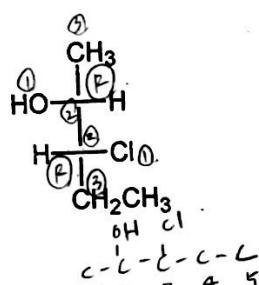


b.

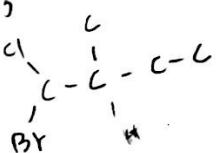
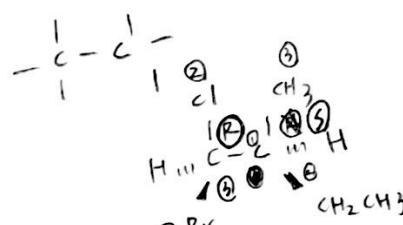
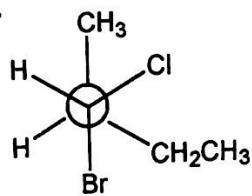


propylene
12. Name the following compounds using R,S designations. (6%)

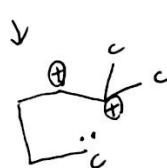
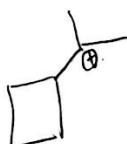
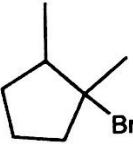
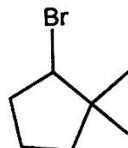
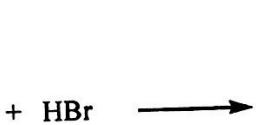
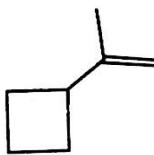
a



b.



13. Propose a stepwise mechanism for the following reaction. (10%)



(6), (10), (14) + 1

記		分	
1	2	15	10
3	0	4	10
5	14	10	10
7	4	13	5
9	15	6	10
11	4	6	10
13	8	14	10
15	10	10	10
17		18	10
19		20	
總分		93	100

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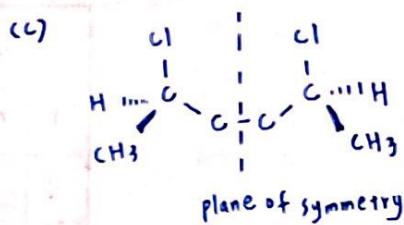
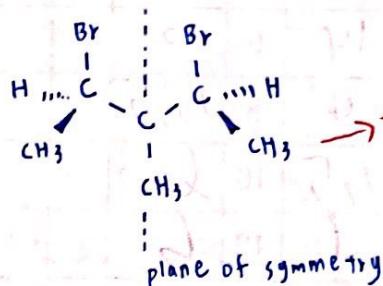
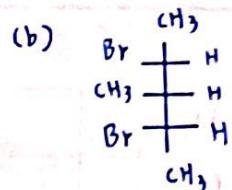
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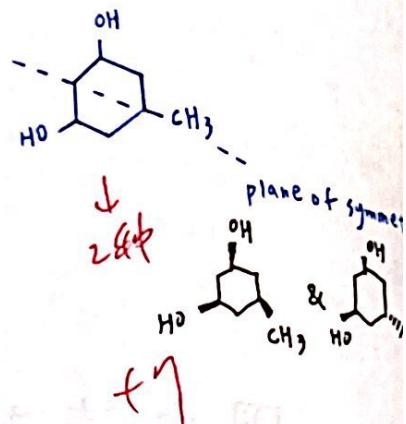
姓名 張小宣

日期 109.11.17

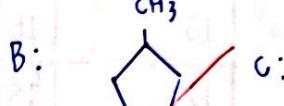
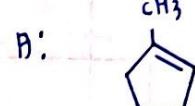
1. (b), (c), (d)



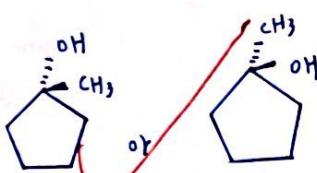
(d)



2.

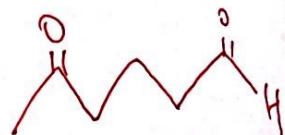
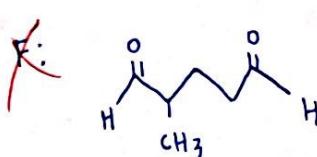
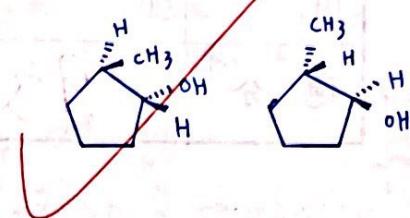


C:

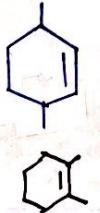


+15

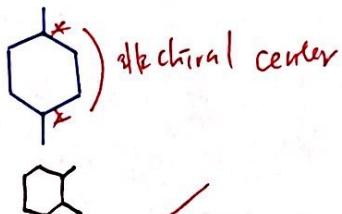
D & E:



X



+ H₂ $\xrightarrow{\text{Pd/C}}$

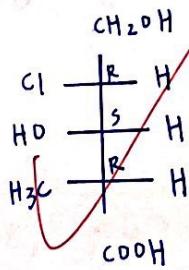


+ 0

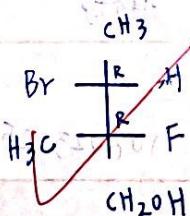
4. heat of hydrogenation: (a) > (d) > (b) > (c) > (e)

+4

5. (a)

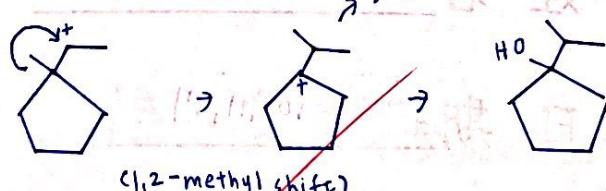


(b)



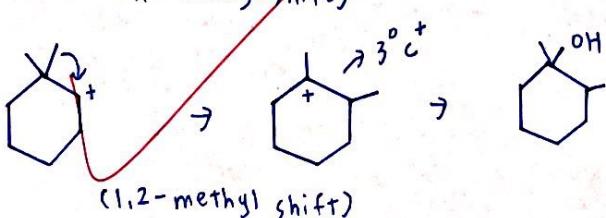
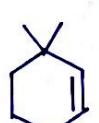
+14

6. ①



\rightarrow ring expansion $\beta\beta$

②

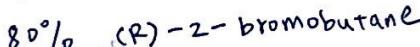


+10

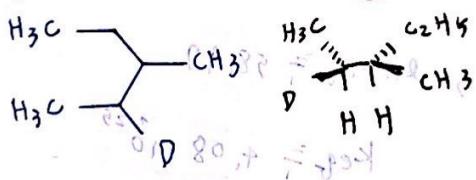
(1,2-methyl shift)



+13,5

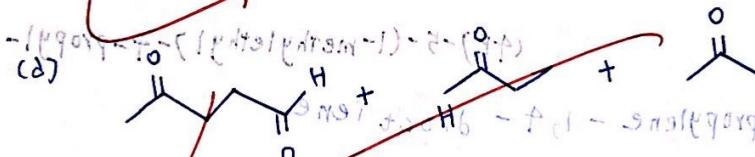
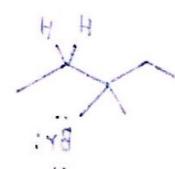
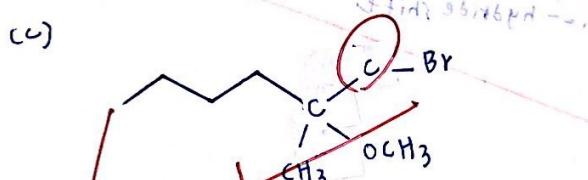
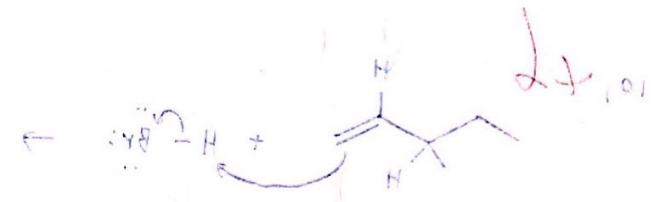
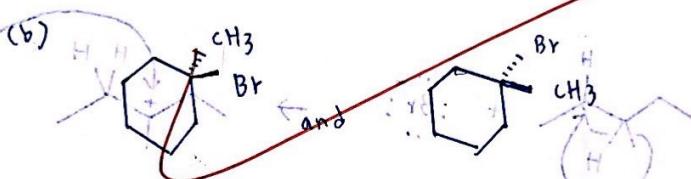


8. X

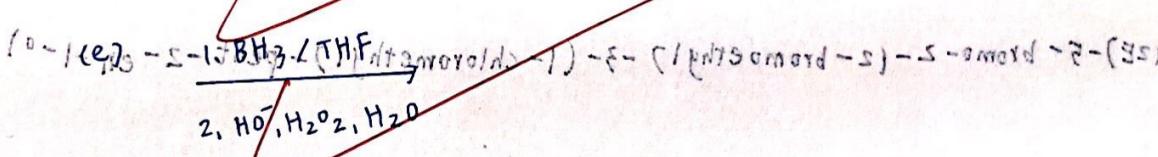


+4

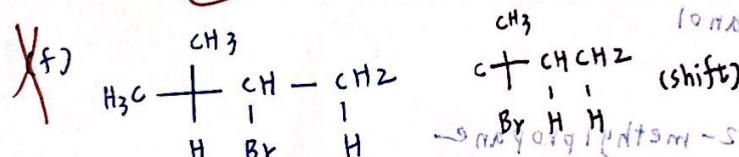
-O/D 80, + Br/20



(d) II

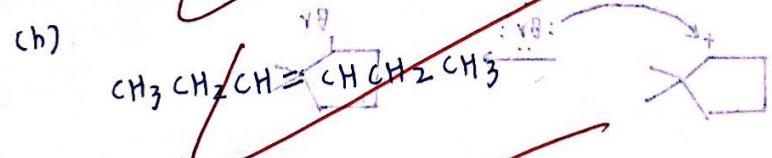
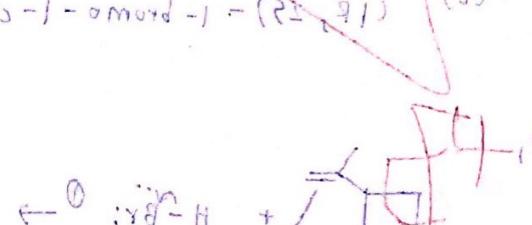
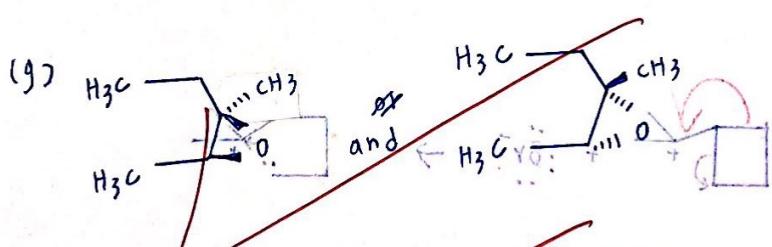


(e) J

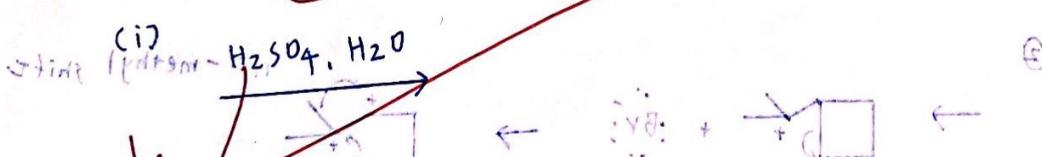


10 mg - S - O - H₂ - E - (9E, 9S) (A) I

10 mg - S - O - H₂ - E - (9E, 9S) (A) I



←



④

