

Seat No. _____

LAST NAME WST

FIRST NAME _____

There are 8 pages to this exam. Check to make sure you have a complete exam.

PLEASE ALSO PRINT YOUR NAME ON THE TOP OF
THE **BACK** OF THE LAST PAGE OF THE EXAM

CHEMISTRY 331

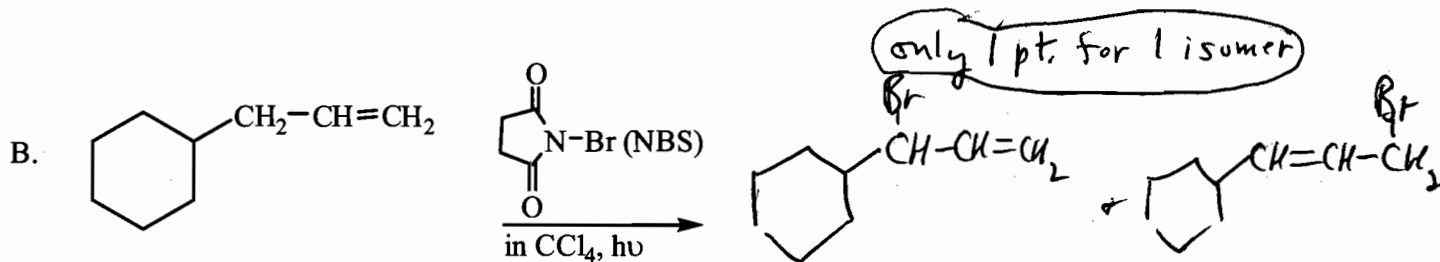
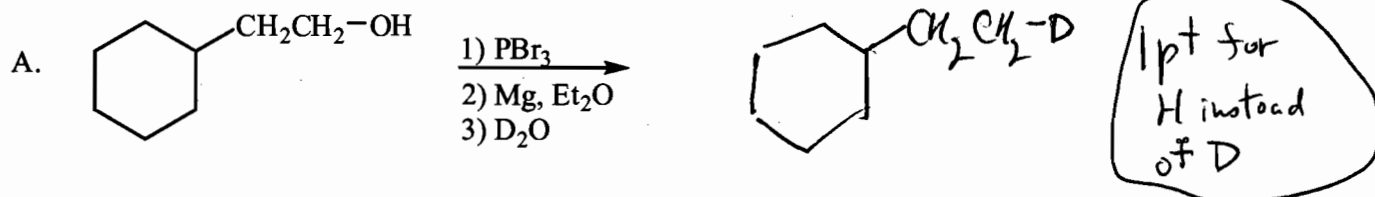
EXAM IV

Spring 2007, April 4, 2007

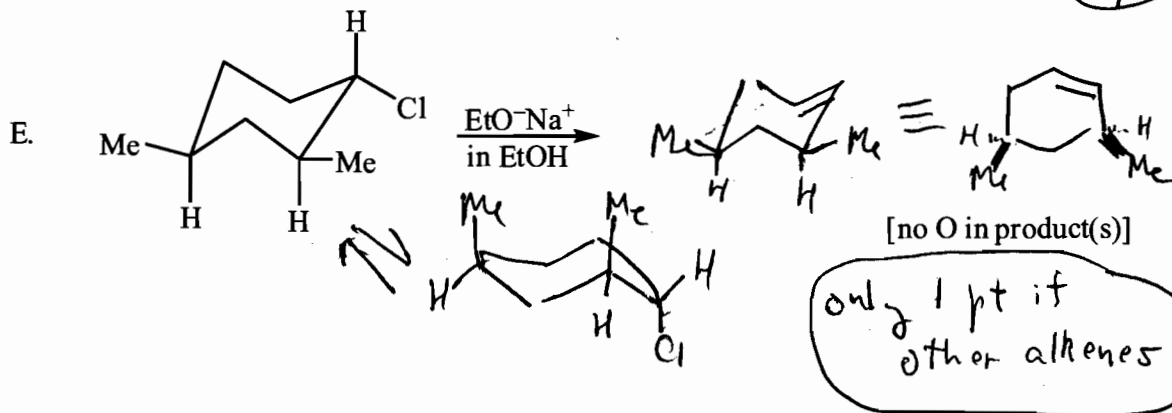
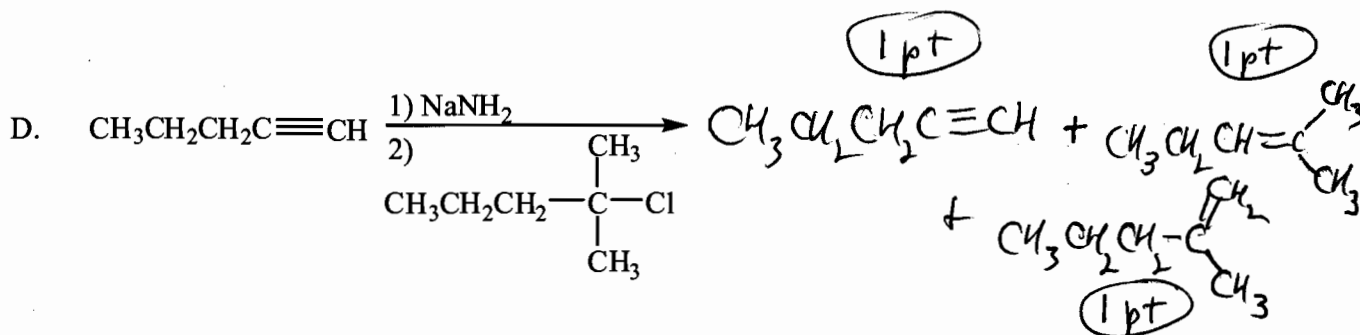
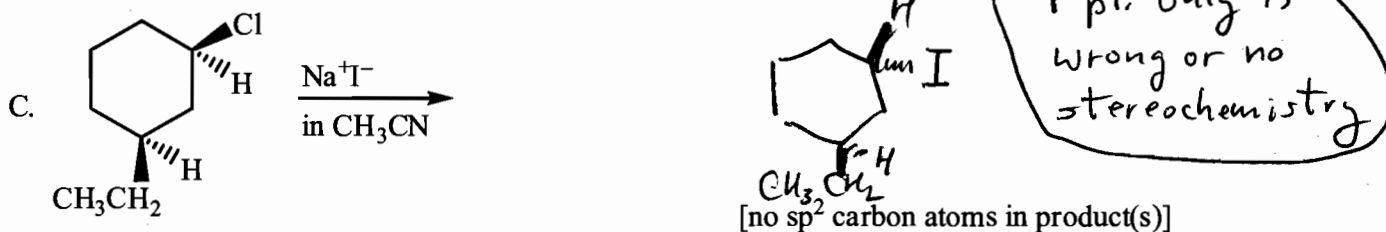
I.	(30 points)	<input type="checkbox"/>	<input type="checkbox"/>	_____
		A-E (15 pts)	F-J (15 pts)	
II.	(12 points)			_____
III.	(18 points)			_____
IV.	(16 points)	<input type="checkbox"/>	<input type="checkbox"/>	_____
		A (8 pts)	B,C (8 pts)	
V.	(9 points)			_____
VI.	(15 points)	<input type="checkbox"/>	<input type="checkbox"/>	_____
		A (7 pts)	B (8 pts)	
TOTAL	(100 points)			_____

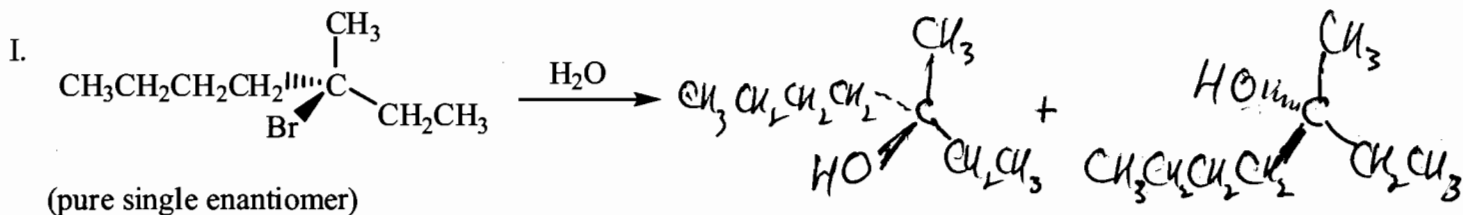
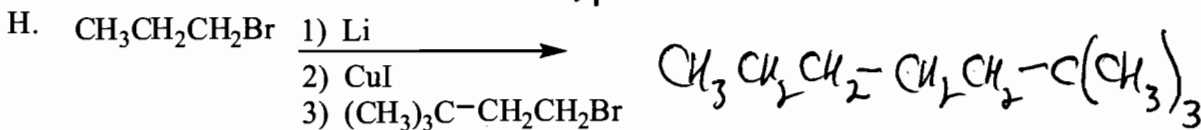
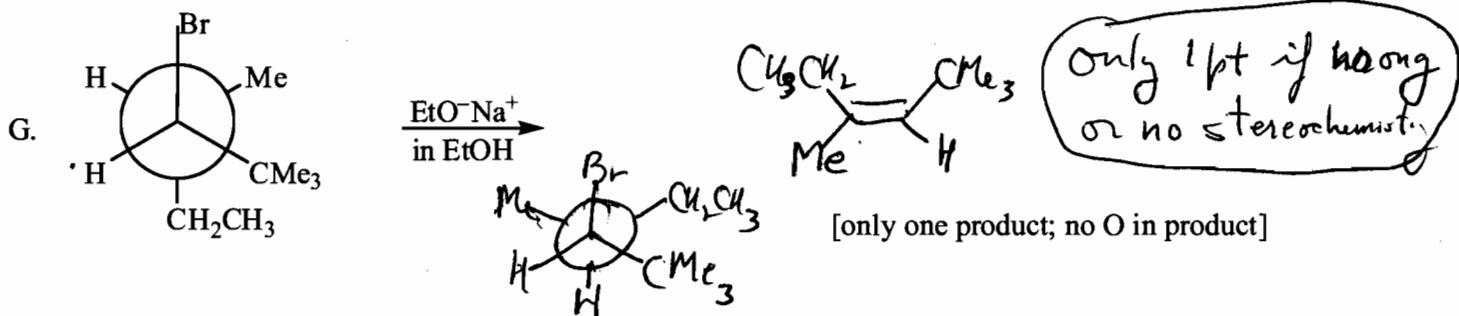
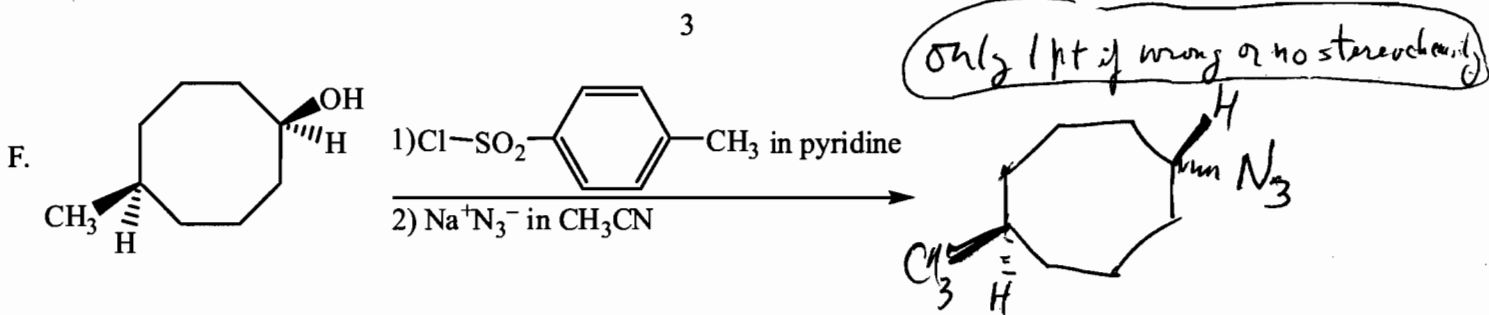
THE FINAL EXAM IS SCHEDULED FOR MONDAY, APRIL 30, FROM 7:30-9:30 A.M. ANY STUDENT WITH 3 EXAMS ON APRIL 30 SHOULD E-MAIL THE CHEM 331 INSTRUCTOR BEFORE APRIL 13 WITH THE LIST OF COURSE CONFLICTS.

I. (30 pts) Complete the following equations giving all organic product(s). Stereochemistry must be clearly indicated in reactions which are stereoselective.



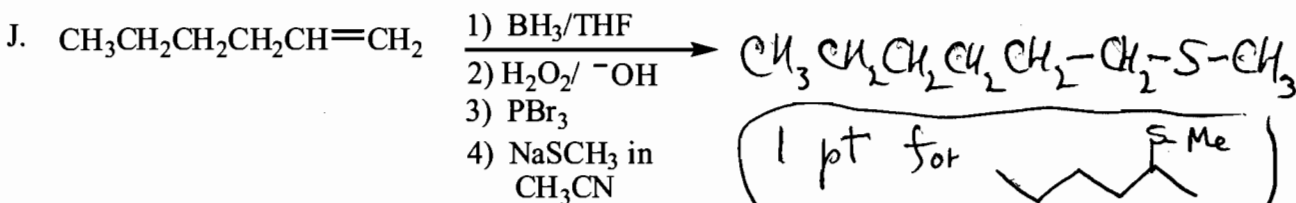
(It is not necessary to show cis-trans isomers)





[no sp^2 carbon atoms in product(s)]

only 1 pt if not both isomers



II. (12 pts) Prepare the following compounds by an S_N2 reaction by choosing a satisfactory substrate and nucleophile for each reaction (stereochemistry must be clearly indicated when necessary).

only 1 point if one reactant is incorrect

-1 for use of Z

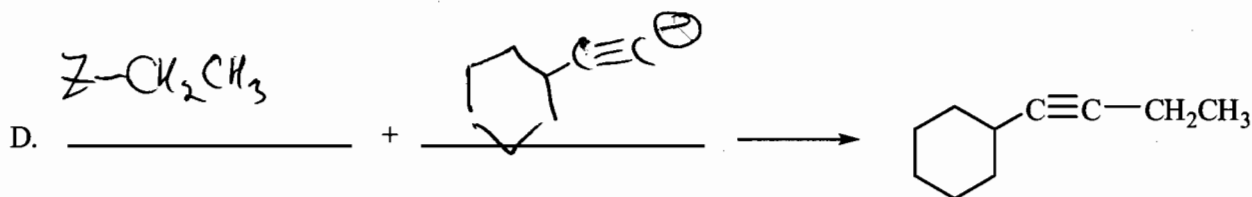
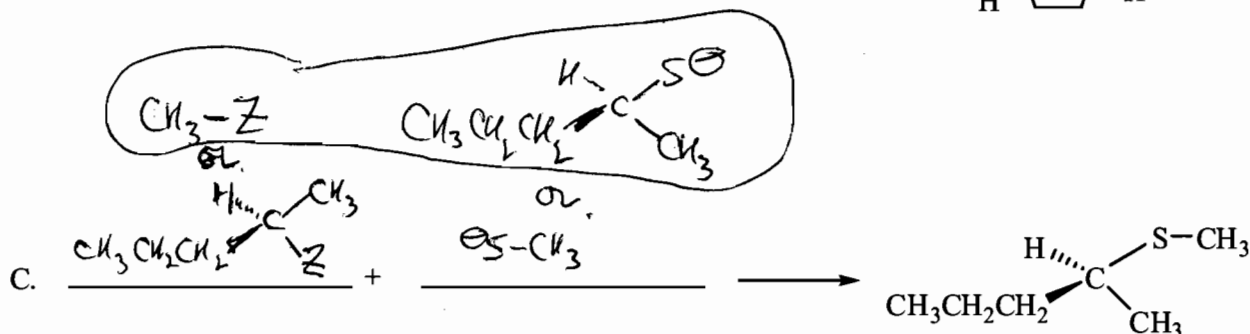
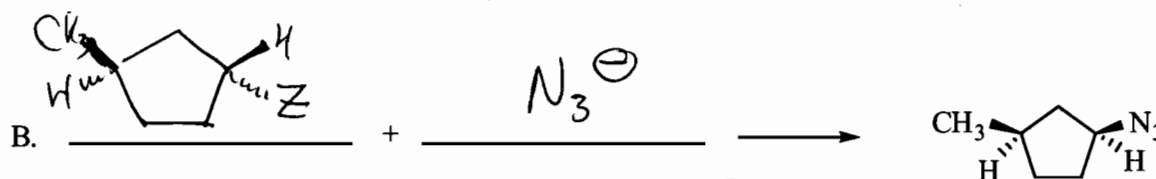
Substrate
Z = -OTos, I, Br, or Cl, etc.

Nucleophile

Product

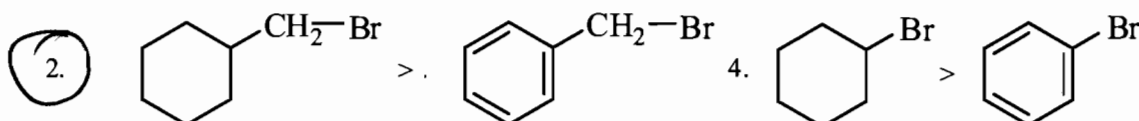
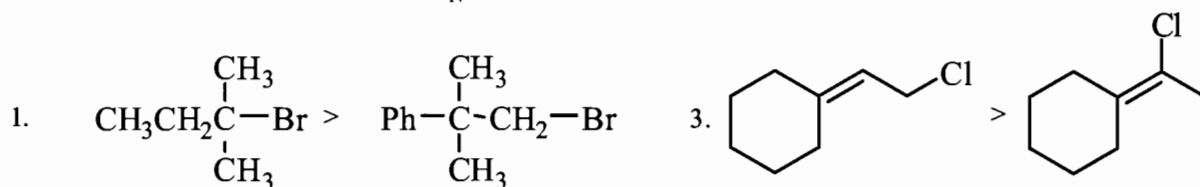


-1 pt for minor error

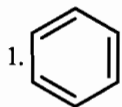


III. (18 pts) Circle the best answer.

A. Which is **NOT** true for S_N1 relative reactivities?



B. Which of the following is the best solvent for S_N1 reactions?



2. Hexane

3. CCl_4

4. 70% H_2O , 30% CH_3CH_2-OH

C. Which of the following is the best nucleophile in an S_N2 reaction?

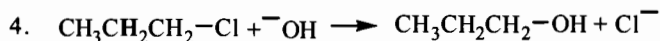
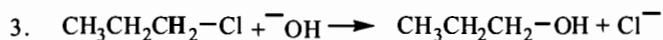
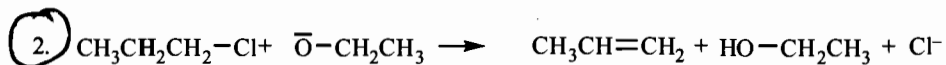
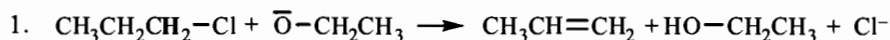
1. CH_3-O-H

2. Br^-

3. Cl^-

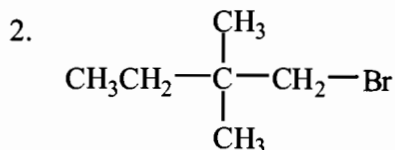
4. F^-

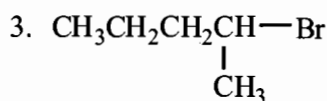
D. Which of the following reactions shows the largest deuterium isotope effect when the bold hydrogens are replaced with deuterium?

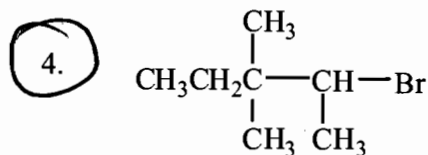


E. Which is the **least** reactive compound in an S_N2 reaction?

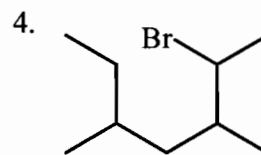
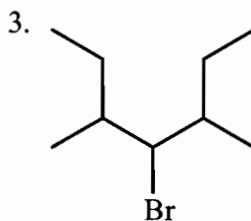
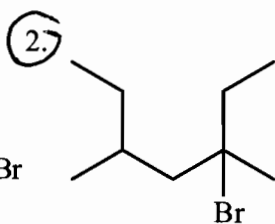
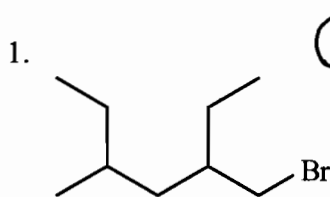
1. $CH_3CH_2CH_2CH_2Br$



3. 

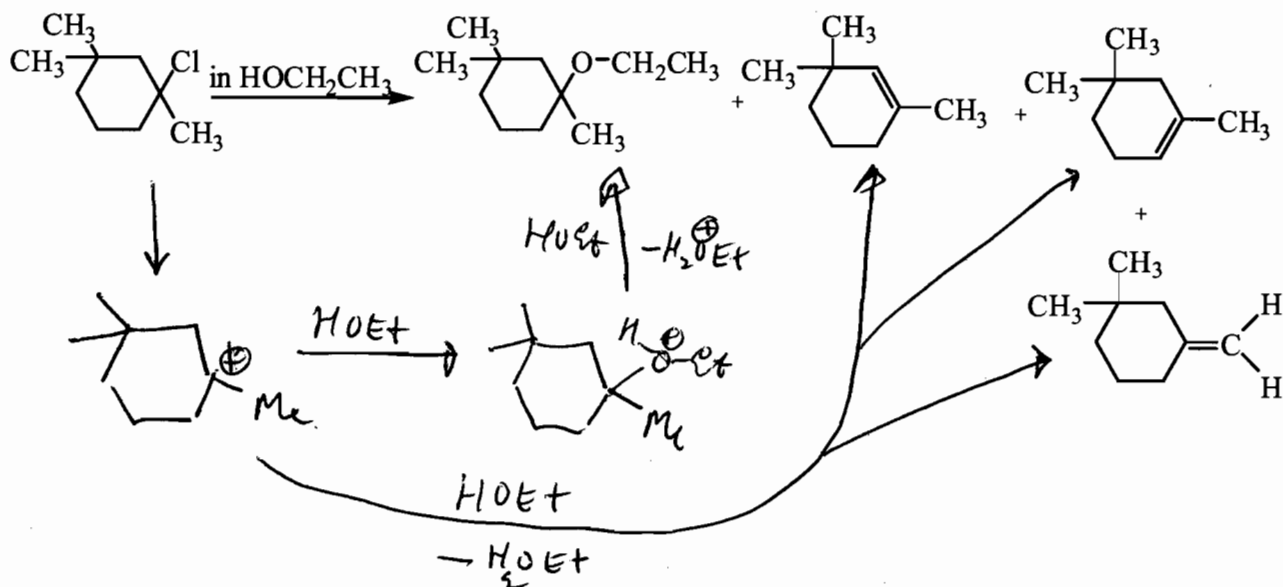
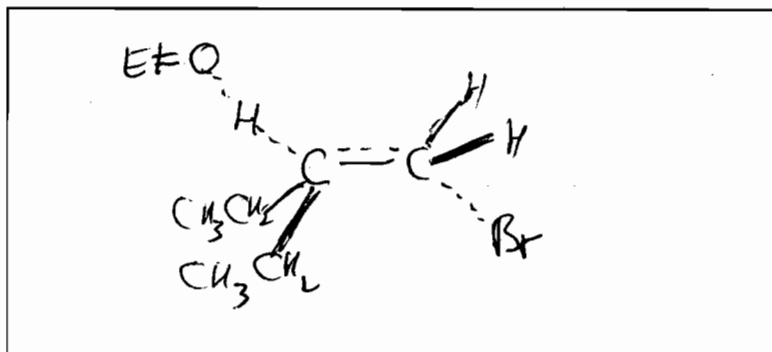
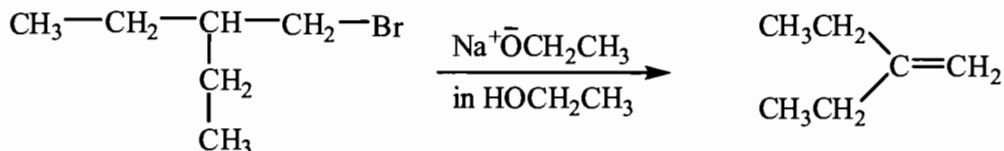


F. Which of the following compounds give the most alkene products (count a pair of cis-trans isomers as two products) in an $E2$ reaction?

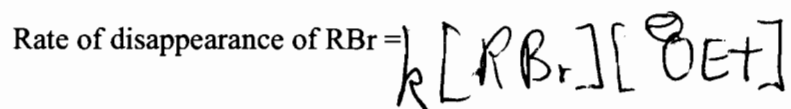


IV. (16 pts)

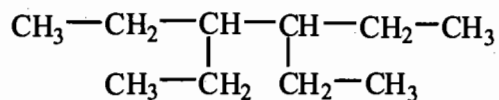
A. (8 pts) Give a reasonable mechanism for the following reaction.

B. (4 pts) In the box provided draw the **transition state** (geometry must be clear) of the rate-limiting step of the following reaction.

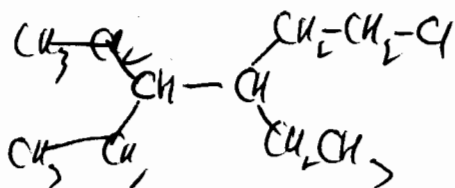
C. (4 pts) Complete the rate equation for the reaction shown in B.



V. (9 pts) If Cl_2 is used as the chlorinating agent in the light-induced chlorination of

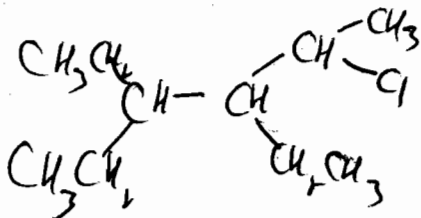


the relative reactivities (per hydrogen) for 1° , 2° , and 3° are 1 to 3.5 to 5 at 25°C . What will the relative proportions of monochloro products (constitutional isomers only) in the reaction mixture be? (Answers may be expressed in fractions). SHOW YOUR WORK. List the reaction products and the fraction of each formed.



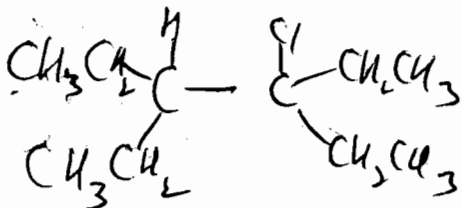
$$(12)(1) = 12$$

$$12/50$$



$$(8)(3.5) = 28$$

$$28/50$$



$$(2)(5) = 10$$

$$10/50$$

1 pt/structure

50
1 pt/structure
for # of H's x reactivity

1 pt/structure

Periodic Table of the Elements

1A 1	2A 2											3A 13	4A 14	5A 15	6A 16	7A 17	8A 18 2
H 1.01	He 4.00											B 10.8	C 12.0	N 14.0	O 16.0	F 19.0	Ne 20.2
3 Li 6.94	4 Be 9.01							8B				5 B 10.8	6 C 12.0	7 N 14.0	8 O 16.0	9 F 19.0	10 Ne 20.2
11 Na 23.0	12 Mg 24.3	3B 3	4B 4	5B 5	6B 6	7B 7	8 8	9 9	10 10	1B 11	2B 12	13 Al 27.0	14 Si 28.1	15 P 31.0	16 S 32.1	17 Cl 35.4	18 Ar 39.9
19 K 39.1	20 Ca 40.1	21 Sc 45.0	22 Ti 47.9	23 V 50.9	24 Cr 52.0	25 Mn 54.9	26 Fe 55.8	27 Co 58.9	28 Ni 58.7	29 Cu 63.5	30 Zn 65.4	31 Ga 69.7	32 Ge 72.6	33 As 74.9	34 Se 79.0	35 Br 79.9	36 Kr 83.8
37 Rb 85.5	38 Sr 87.6	39 Y 88.9	40 Zr 91.2	41 Nb 92.9	42 Mo 95.9	43 Tc (98)	44 Ru 101	45 Rh 103	46 Pd 106	47 Ag 108	48 Cd 112	49 In 115	50 Sn 119	51 Sb 122	52 Te 128	53 I 127	54 Xe 131
55 Cs 133	56 Ba 137	57 La 139	72 Hf 178	73 Ta 181	74 W 184	75 Re 186	76 Os 190	77 Ir 192	78 Pt 195	79 Au 197	80 Hg 201	81 Tl 204	82 Pb 207	83 Bi 209	84 Po (209)	85 At (210)	86 Rn (222)
87 Fr (223)	88 Ra 226	89 Ac 227	104 Rf (261)	105 Db (262)	106 Sg (263)	107 Bh (262)	108 Hs (265)	109 Mt (266)									

