

Seat No. _____

Last Name: WST

First Name: _____

There are 7 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 II

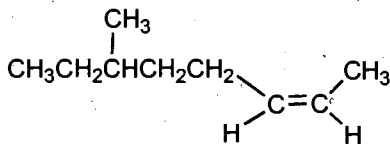
Spring 2009 (2/20/09)

I.	(18 Points)	_____
II.	(9 Points)	_____
III.	(11 Points)	_____
IV.	(6 Points)	_____
V.	(11 Points)	_____
VI.	(20 Points)	_____
VII.	(14 Points)	_____
VIII.	(11 Points)	_____
TOTAL	(100 Points)	_____

I. (18 points)

A. (12 points) Give the proper name for the following structures (including stereochemical designation when required; for stereoisomers use *E*-, *Z*-notations).

1.



(or 2 here) or here)

Z-6-methyloct-2-ene

2.

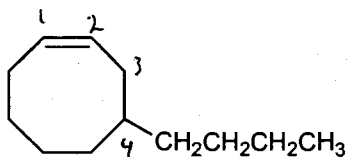


1 pt

1 pt 1 pt 1 pt

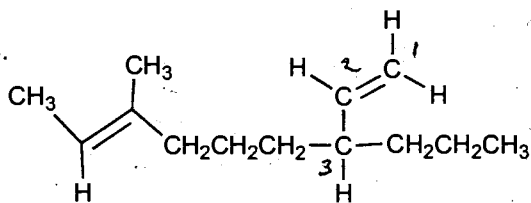
bicyclo[3.3.1]nonane

3.



4-butylcyclooctene

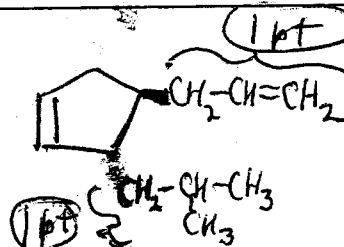
4.



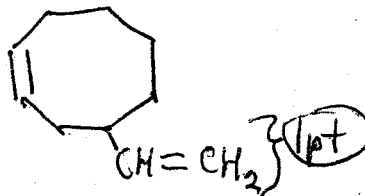
(or 1, 7 here) or here

E-7-methyl-3-propylnona-1,7-diene

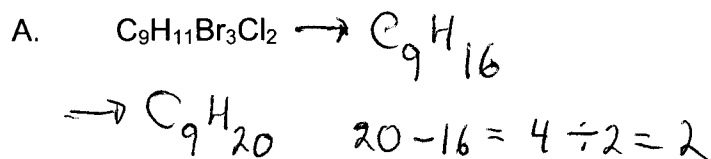
B. (6 points) Draw clear structural formulas or skeletal structures, including stereochemistry where needed of the following molecules.

1. *trans*-4-allyl-3-isobutylcyclopentene

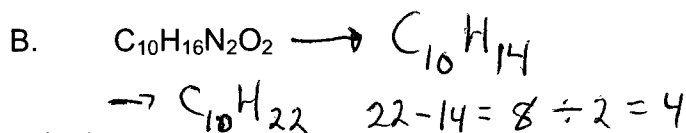
2. 4-vinylcyclooctene



IV. (6 points) Calculate the degree of unsaturation for the following formulas.



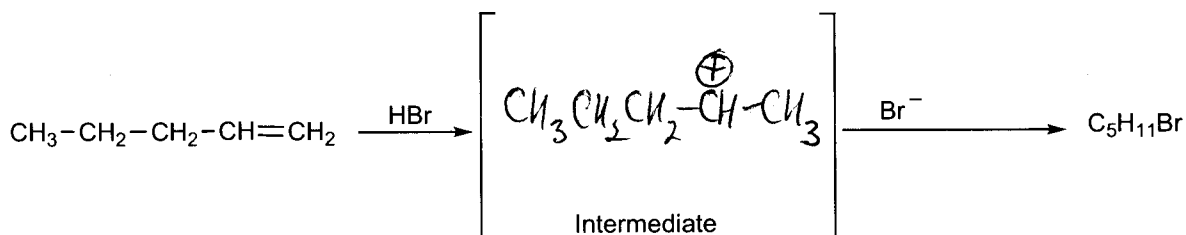
2



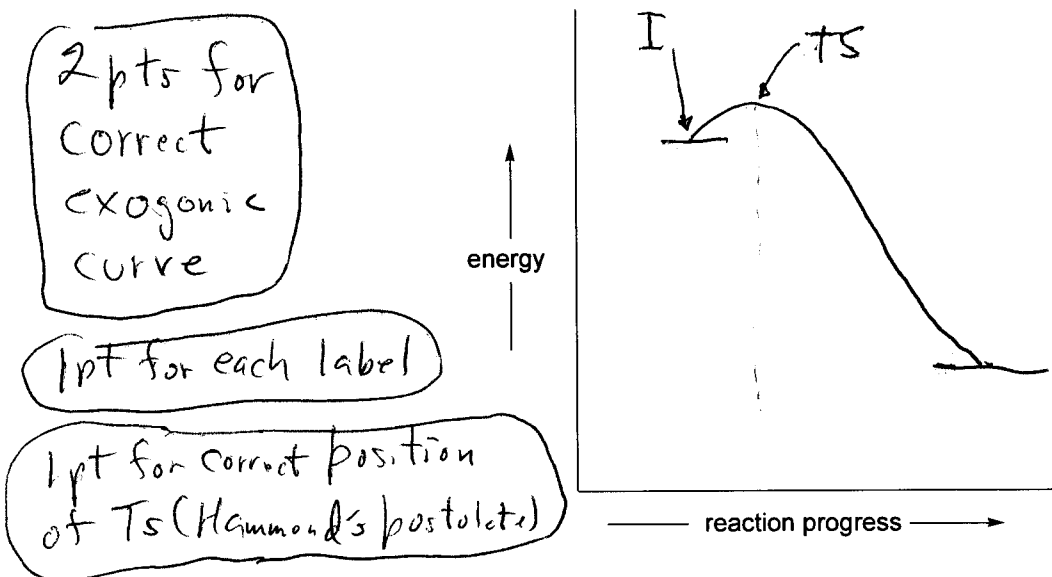
4

V. (11 points)

A. (3 points) In the brackets provided draw the organic intermediate of the following 2-step reaction (one high-energy intermediate is involved in this reaction).



B. (5 points) On the following graph draw the reaction energy diagram for the **second step** of the above reaction. This diagram should be consistent with the Hammond postulate. Label the position of the transition state with "TS" and the intermediate with "I".



C. (3 points) In the **second step**, Br^- is functioning as:

- 1) a catalyst 2) a base 3) an electrophile

4) a nucleophile

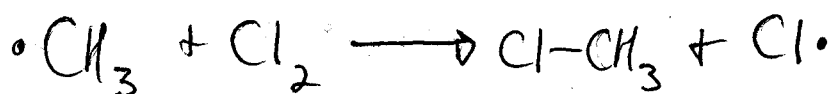
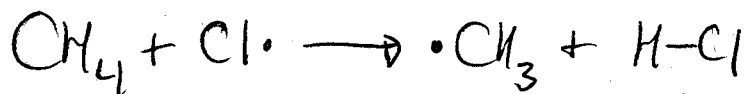
VI. (20 points)

A. (4 points) Give the four general types (or kinds) of organic reactions that McMurry presents.

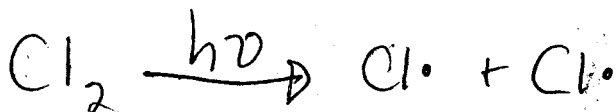
(Note: These do not tell how the reactions occur.)

1. Addition
2. Elimination
3. Substitution
4. Rearrangement

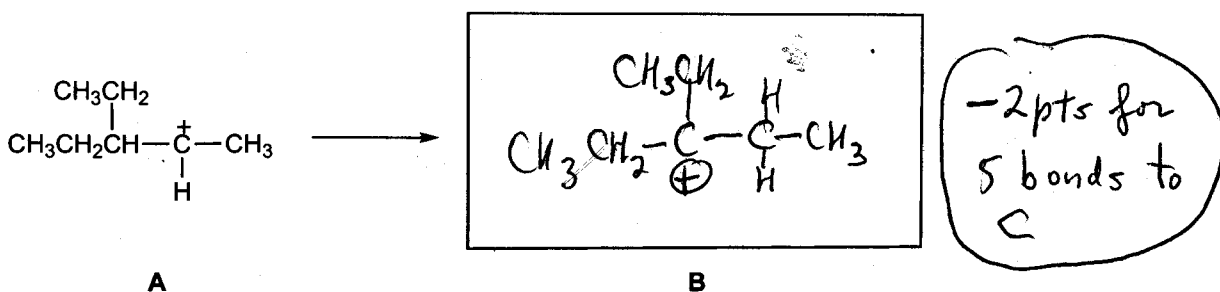
B. (6 points) Write two good propagation steps for the light-induced chlorination of methane.



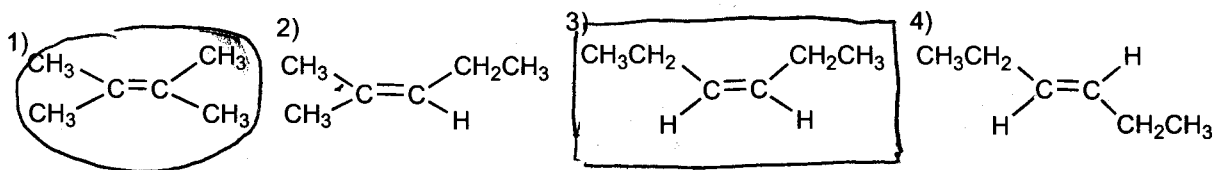
C. (3 points) Write the initiation step for the light-induced chlorination of methane.



D. (3 points) Carbocation A rearranges rapidly to carbocation B. Give the structure of carbocation B.

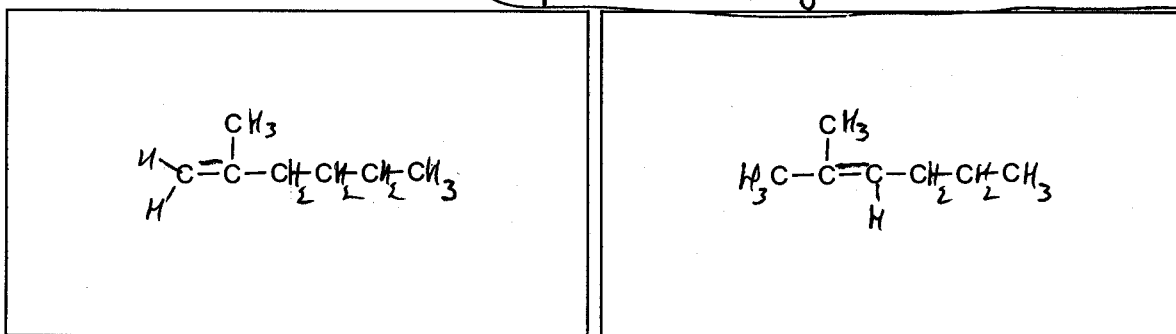


E. (4 points) Circle the most stable alkene and put a square around the least stable.

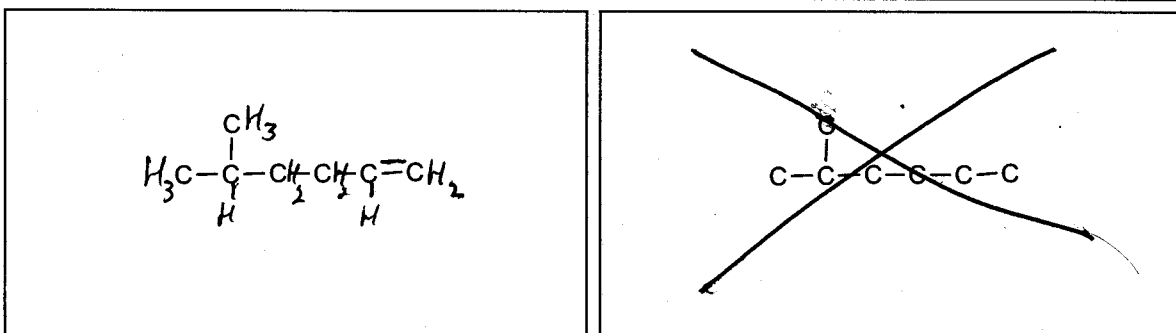
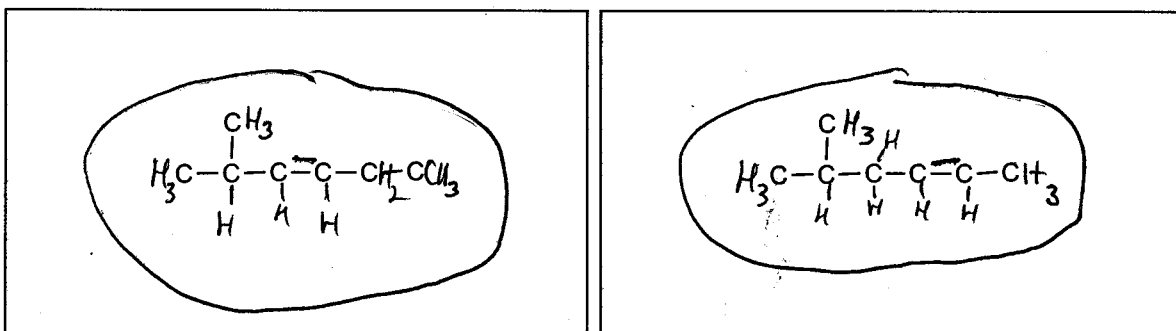


VII. (14 points)

- A. Complete the structures below to show ALL constitutional isomers (note: constitutional isomers only, no stereoisomers) of C_7H_{14} that have a carbon-carbon double bond and the carbon skeleton of 2-methylhexane (this is the carbon skeleton given in the boxes; there are no more than six correct constitutional isomers and there may be fewer; DO NOT DRAW OTHER ISOMERS OF C_7H_{14}). **Be sure to show all hydrogens.** Cross out any boxes that are not used. Points will be deducted for duplicate or incorrect structures. *-1 pt for one major error, -2 pts for 2 or more*



major errors



2 points for each correct isomer, -2 for each incorrect or duplicate isomer

- A. Circle all the structures that can exist as cis-trans isomers (points will be deducted for circling structures that cannot exist as cis-trans isomers).

+4 pts for 2 correct circles + no incorrect ones
 +2 " " 1 " circle + " " "
 +2 " " 2 " circles + 1 " "
 0 " " 1 " circle + 1 " "
 0 " " 2 or more incorrect circles

