Last Name WST _____ Seat No. _____

First Name _____ Lecture Section A
(Please print your name)

Circle your recitation time:

Fri. 12:10 PM	Mon. 4:10 PM	Fri. 11:00 AM
Fri. 2:10 PM	Tues. 9:00 AM	Mon. 11:00 AM
Fri. 3:10 PM,	Tues. 12:10 PM	Mon. 2:10 PM
Mon. 12:10 PM	Tues. 1:10 PM	Tues. 10:00 AM
Mon. 1:10 PM	Fri. 9:00 AM	

There are 9 pages to this exam. Check to make sure you have a complete exam.

PLEASE NOTE: You will be required to answer only some of the questions in this exam. It is your responsibility to clearly cross out the questions that you do not answer. If there is any doubt about which questions of a specific section you did not work, **the last questions in that section will be crossed out.**

CHEMISTRY 331

EXAM III

Tuesday, October 23, 2007

I. (18 points) _____

II. (17 points) _____

III. (6 points) _____

IV. (12 points) _____

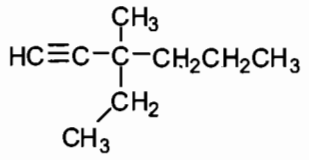
V. (12 points) _____

VI. (21 points) _____

VII. (14 points) _____

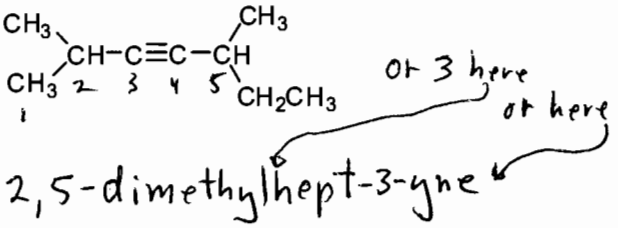
TOTAL (100 points) _____

Ia. Give the proper name for each including stereochemical designation when required. (9 pts)



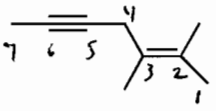
or 1 here or here

3-ethyl-3-methyl-1-hexyne



or 3 here or here

2,5-dimethylhept-3-yne

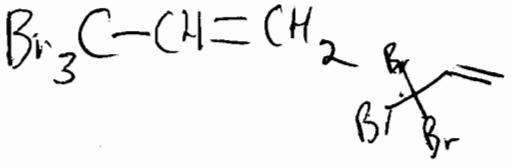


1 pt for ene + yne

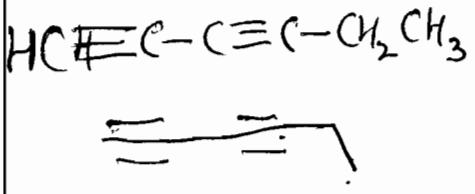
2,3-dimethylhept-2-en-5-yne

b. Write the structure for each of the following. (9pts)

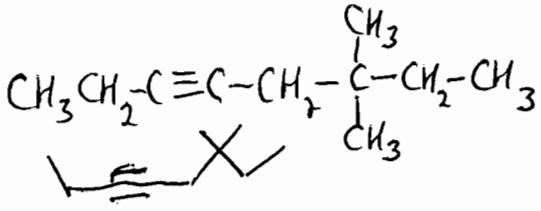
3,3,3-tribromopropene



1,3-hexadiyne



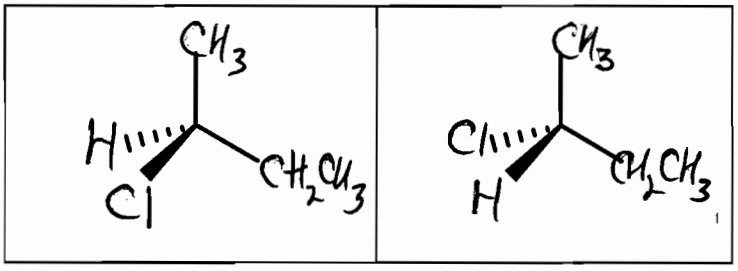
6,6-dimethyl-3-octyne



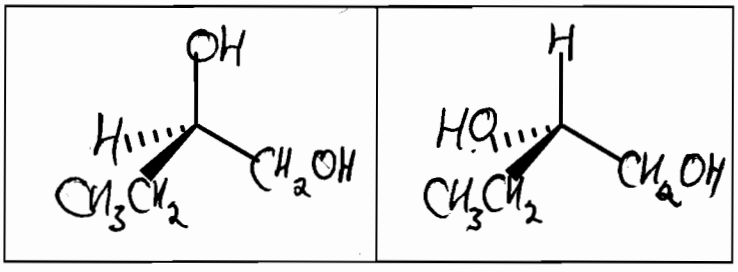
1A 1									8B								8A 18
1 H 1.01	2A 2											3A 13	4A 14	5A 15	6A 16	7A 17	2 He 4.00
3 Li 6.94	4 Be 9.01											5 B 10.8	6 C 12.0	7 N 14.0	8 O 16.0	9 F 19.0	10 Ne 20.2
11 Na 23.0	12 Mg 24.3	3B 3	4B 4	5B 5	6B 6	7B 7	8	9	10	1B 11	2B 12	13 Al 27.0	14 Si 28.1	15 P 31.0	16 S 32.1	17 Cl 35.4	18 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 Ha (262)	106 Unh (263)	107 Uns (262)	108 Uno (265)	109 Une (266)									

IIa. Locate the chirality center (stereogenic center) in each compound and draw (using dotted lines and wedges) both enantiomers. (8pts)

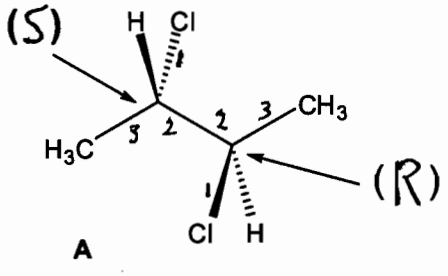
$CH_3CH(Cl)CH_2CH_3$



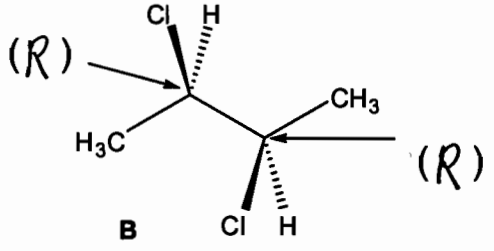
$CH_3CH_2CH(OH)CH_2OH$



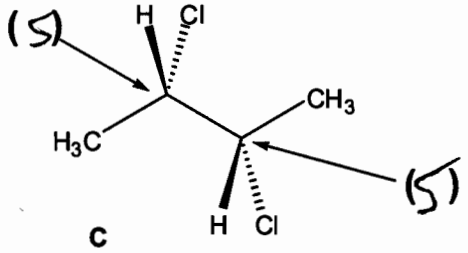
b. Shown below are the structures of three stereoisomers of 2,3-dichlorobutane. Label the chiralty centers (stereogenic centers) as R or S. (9pts).



A



B



C

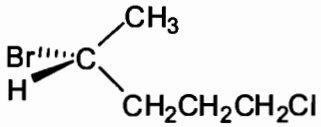
Indicate which isomers fit the appropriate relationship.

A pair of enantiomers B + C

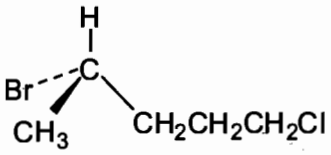
A pair of diastereomers A + B (or A + C) **A meso compound** A

III. Label each pair of structures as I (identical), E (enantiomers), or (D) (diastereomers). (6 pts.)

a.

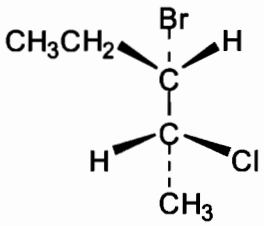


and

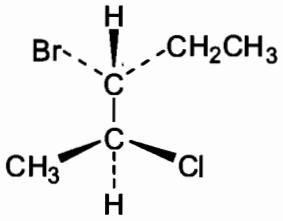


E

b.

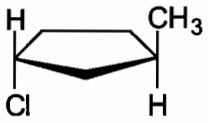


and

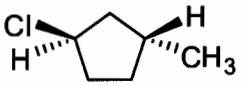


E

c.



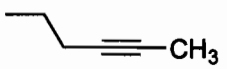
and

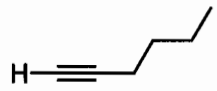


I

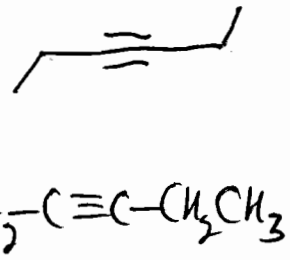
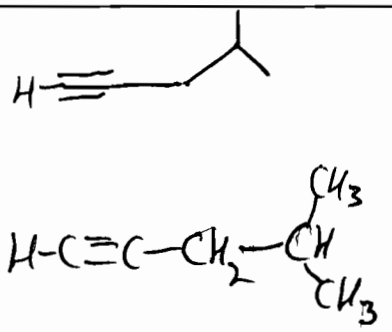
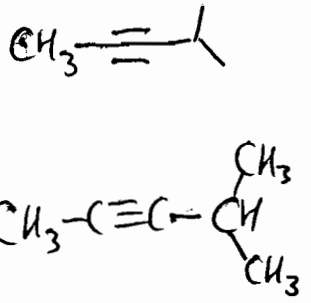
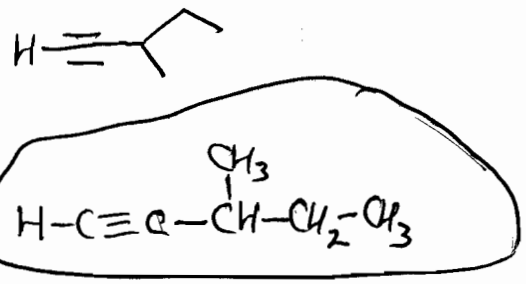
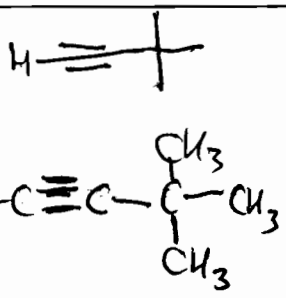
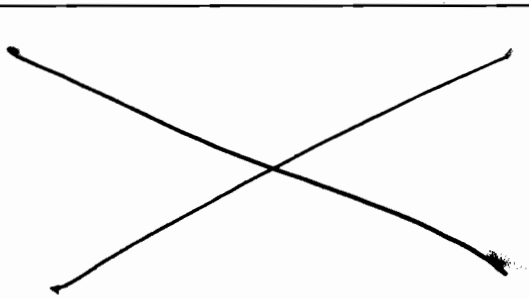
IV. (12pts)

a. There are several constitutional isomers with the molecular formula C_6H_{10} which contain a carbon-carbon triple bond. We have drawn two isomers below. Draw all of the remaining constitutional isomers (there are no more than 6 constitutional isomers remaining and there may be fewer. Cross out any boxes that are not used. Points will be deducted for duplicate or incorrect structures.





+2 for each correct structure

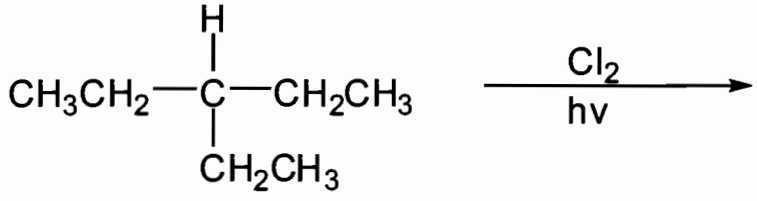
	
	
	

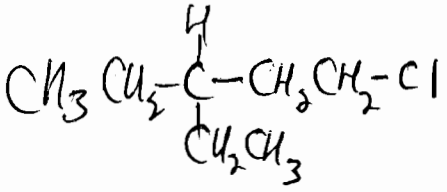
-2 pts for each incorrect or duplicate structure

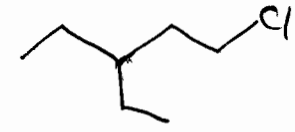
b. Circle all isomers that have a chirality center (stereogenic center). 2 pts

V. (12 pts.)

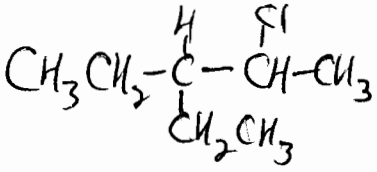
Va. Draw the structures of all the possible monochlorinated products (constitutional isomers only) for the radical chlorination reaction shown below.

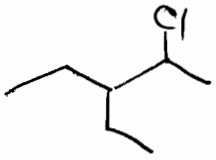




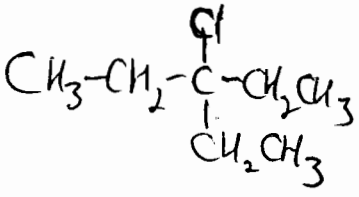


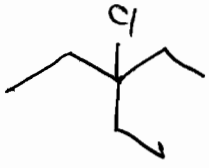
(9)(1) = 9 9/35





(6)(3.5) = 21 21/35





(1)(5.0) = 5 5/35

1 pt/structure for # of Hs x reactivity

9 + 21 + 5 = 35

2 pts/structure
– 2 pts for duplicate structure

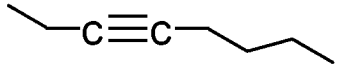
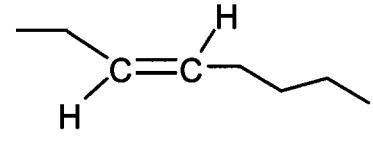
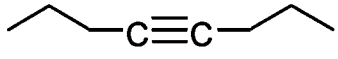
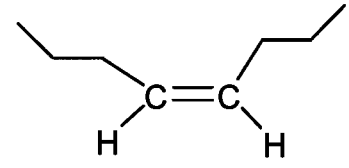
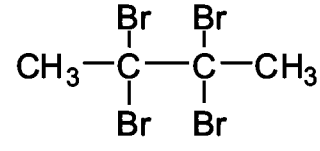
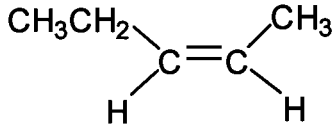
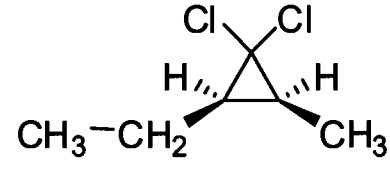
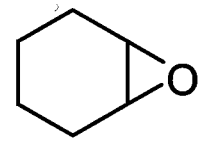
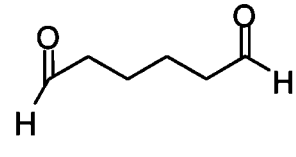
Vb. The relative reactivities (per hydrogen) for 1°, 2°, and 3° hydrogen atoms are 1 to 3.5 to 5 at 25° C. What will the relative proportions of monochloro products (constitutional isomers only) in the reaction mixture be? (Answers may be expressed as <u>fractions</u>). SHOW YOUR WORK.

1 pt/structure for correct proportion

–2 pts for math error

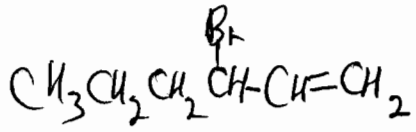
VIa. Using the reagents in the table below, indicate (by putting the letter over the arrow) which is the appropriate reagent to use to carry out 5 out of the following 7 reactions. (15 pts)

$\xrightarrow[Pd/C]{2eq.\ H_2}$ **a**	$\xrightarrow[Lindlar\ Catalyst]{H_2}$ **b**	$\xrightarrow[KOH]{CHCl_3}$ **c**	$\xrightarrow[CH_2Cl_2]{Br_2}$ **d**	$\xrightarrow[Ether]{CH_2I_2,\ Zn(Cu)}$ **e**
$\xrightarrow[2.\ Zn/H_3O^+]{1.\ O_3}$ **f**	$\xrightarrow[2.NaHSO_3,\ H_2O]{1.\ OsO_4}$ **g**	$\xrightarrow{R-\overset{O}{\overset{\|}{C}}-OOH}$ **h**	$\xrightarrow{SOCl_2}$ **i**	$\xrightarrow[NH_3]{Li}$ **j**

1) 	j	
2) 	b	
3) $CH_3-C\equiv C-CH_3$	d	
4) 	c	
5) 	h	
6) $CH_3CH_2CH_2CH_2OH$	l	$CH_3CH_2CH_2CH_2Cl$
7) 	f	

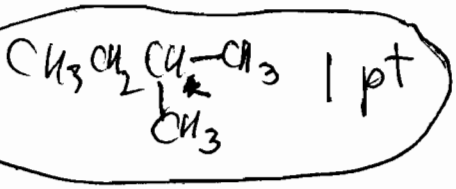
VIb. Complete the following equations giving all organic products (only constitutional isomers need to be shown). (6 pts.)

1. $CH_3CH_2CH_2CH_2CH{=}CH_2$ —(N-Br (NBS), in CCl_4, hν)→ $CH_3CH_2CH_2CH{=}CH{-}CH_2{-}Br$



1 point for one isomer
3 pts for two products

2. $CH_3CH_2CH_2Br + (CH_3)_2CuLi$ ⟶ $CH_3CH_2CH_2{-}CH_3$



1 pt

VIII. Beginning with the starting material indicated, show how to achieve two of the following three syntheses by showing all the reactions that are needed. (For each reaction shown, give the starting material, conditions over the arrow, and the products). You may use any inorganic compound or organic compound with one or two carbons. (14 pts.)