

Scratch paper

Do not write any answers you wish to be graded on this page

Scratch paper

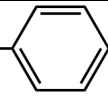
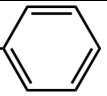
Do not write any answers you wish to be graded on this page

USEFUL INFORMATION

Partial periodic table

Atomic numbers and electronegativities

IA	IIA	IIIA	IVA	VA	VIA	VIIA	VIIIA
1 H 2.20							2 He —
3 Li 0.98	4 Be 1.57	5 B 2.04	6 C 2.55	7 N 3.04	8 O 3.44	9 F 3.98	10 Ne —
11 Na 0.93	12 Mg 1.31	13 Al 1.61	14 Si 1.90	15 P 2.19	16 S 2.58	17 Cl 3.16	18 Ar —
19 K 0.82	20 Ca 1.00	31 Ga 1.81	32 Ge 2.01	33 As 2.18	34 Se 2.55	35 Br 2.96	36 Kr —
37 Rb 0.82	38 Sr 0.95	49 In 1.78	50 Sn 1.96	51 Sb 2.05	52 Te 2.1	53 I 2.66	54 Xe —
55 Cs 0.79	56 Ba 0.89	81 Tl 2.04	82 Pb 2.33	83 Bi 2.02	84 Po 2.0	85 At 2.2	86 Rn —

Type of hydrogen	δ [ppm]	Type of hydrogen	δ [ppm]	Type of hydrogen	δ [ppm]
alcohol $H-O$	variable	$H-C\equiv C$	2-3	$H-C-O$	3.2-3.8
$H-N$	variable	$H-C-N$	2.2-2.8	$H-C=C$	4-7
$H-R$	0.8-1.6	$H-C$ 	2.2	H 	6.5-8.5
$H-C-C=C$	1.6	$H-C-X$ (X = Cl, Br, I)	2.2-4.2	$H-C=O$	8-10
$H-C-C=O$	2.0-2.2			acid $H-O$	10-14

CAS CH 203
Final Examination

Organic Chemistry I
16 Dec 2010, 12:30 P.M.–2:30 P.M.

Name _____

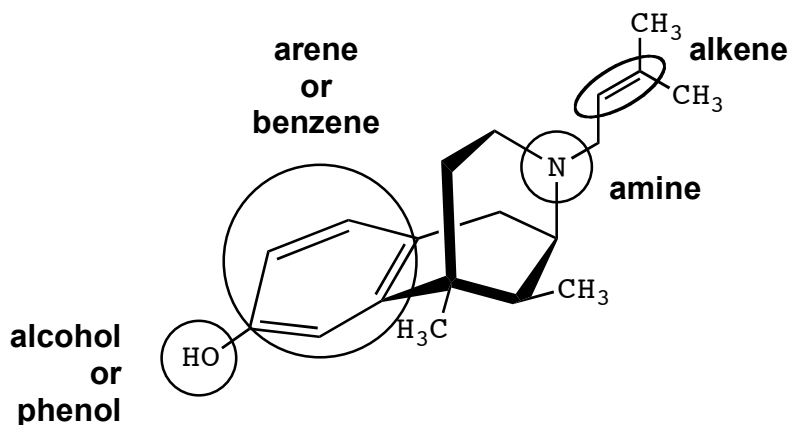
ID Number _____

Instructions

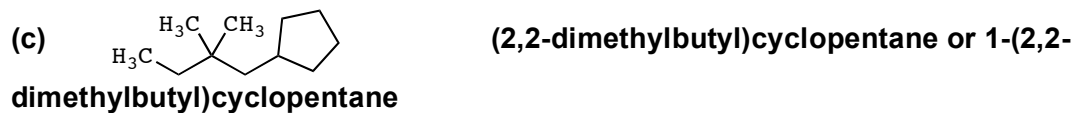
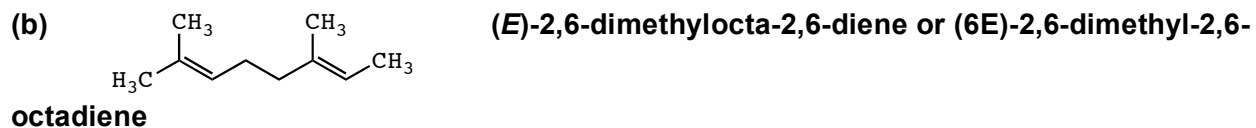
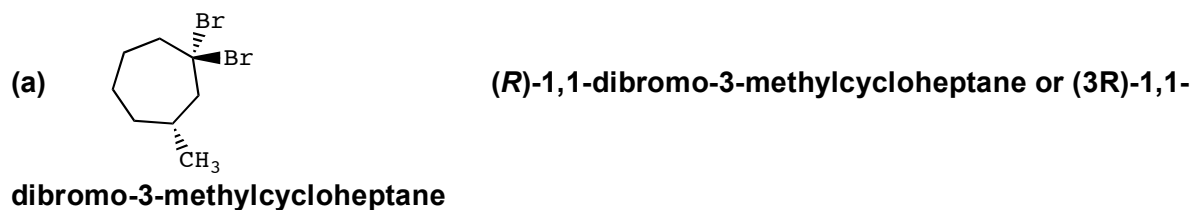
- (A) Make sure you have 6 pages with 9 questions.
- (B) Write all answers on the pages provided.
- (C) Only answers written in ink will be considered for regrading.
- (D) Good luck!

Page	Score
1	/22
2	/19
3	/12
4	/27
5	/10
6	/12
Total	/100

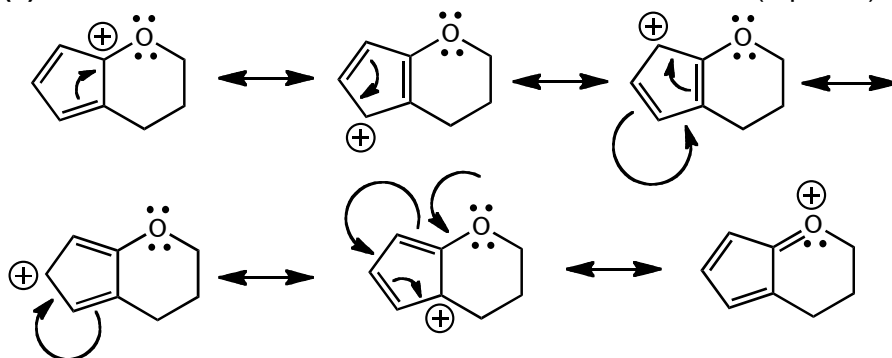
(1) Circle and name the functional groups in the obstetric anesthetic pentazocine. (4 points)



(2) Write the systematic name of these compounds; include stereochemical designations where appropriate. (9 points)



(3) Draw three additional resonance structures of this ion. (9 points)

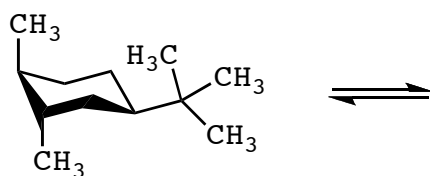


(4) The chair conformation shown below is in equilibrium with a second chair.

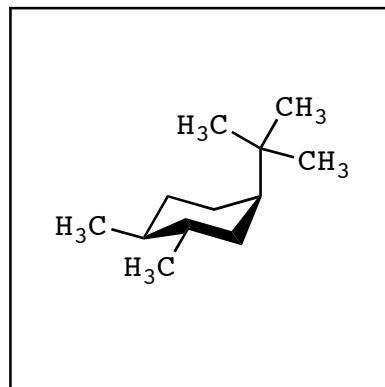
(a) In the box provided draw the second chair.
(4 points)

(b) Using data in the table calculate the strain energy (E_{strain}) of both chairs; write your answers in the space provided. (6 points)

Interaction	E_{strain} [kcal/mol]
CH ₃ ,CH ₃ <i>gauche</i>	0.9
CH ₃ ,H 1,3-diaxial	0.9
C(CH ₃) ₃ ,H 1,3-diaxial	2.7

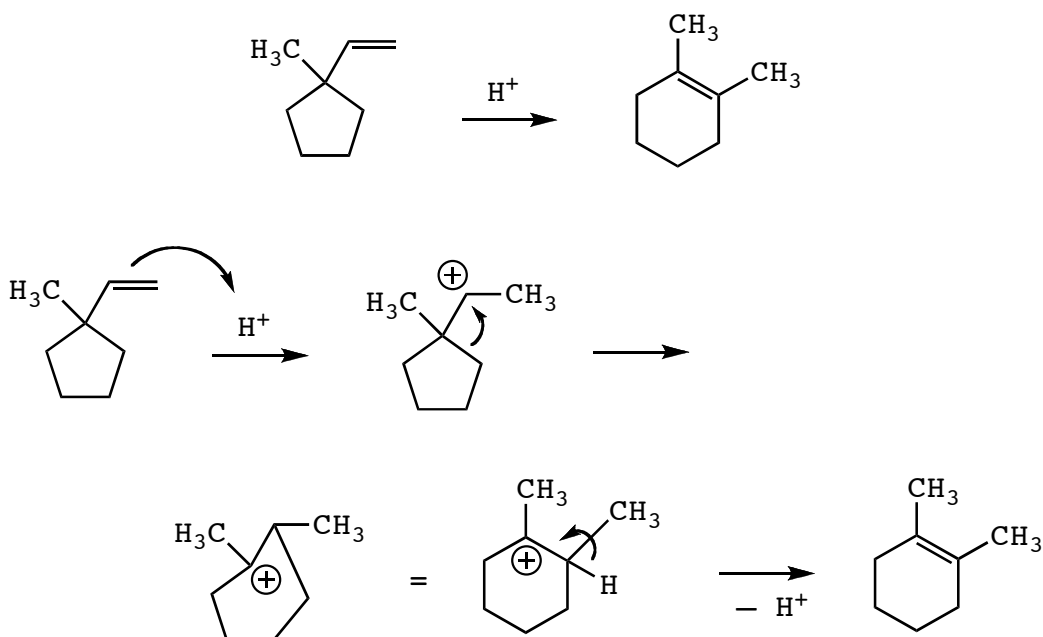


$$E_{\text{strain}} = 3.6 \text{ kcal/mol}$$

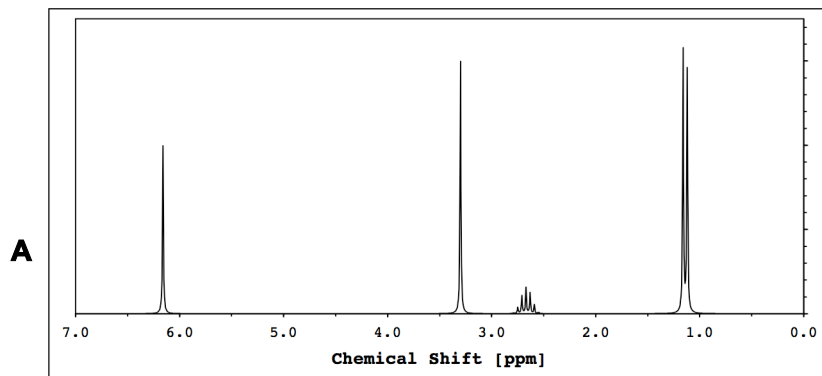


$$E_{\text{strain}} = 6.3 \text{ kcal/mol}$$

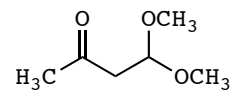
(5) Write a mechanism of this reaction; use curved arrows to show the movement of electrons.
(9 points)



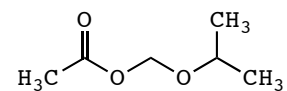
(6) Match NMR spectra **A–D** to the appropriate compound at right; write your answer in the space provided. (12 points)



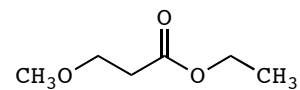
B



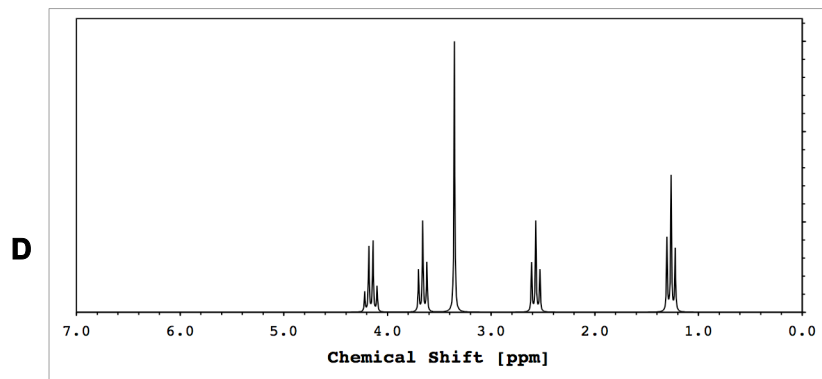
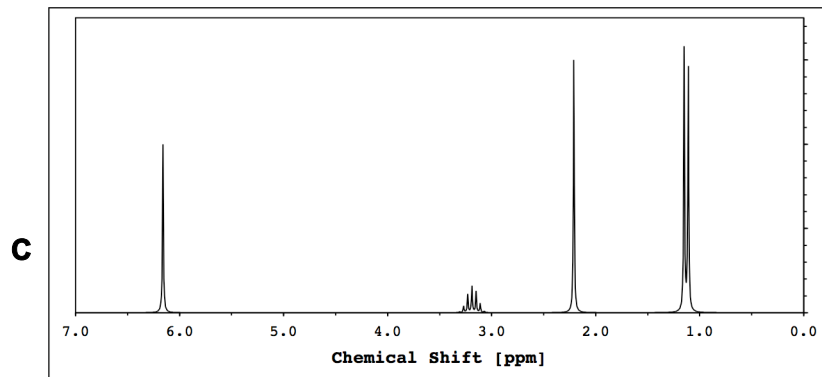
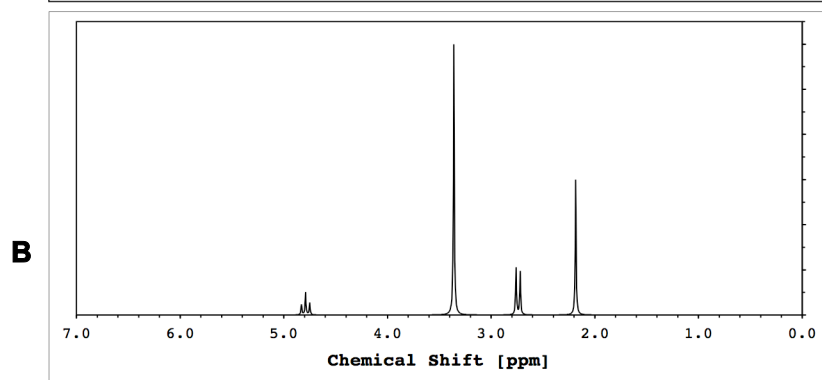
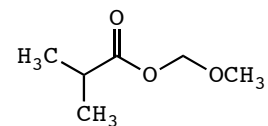
C



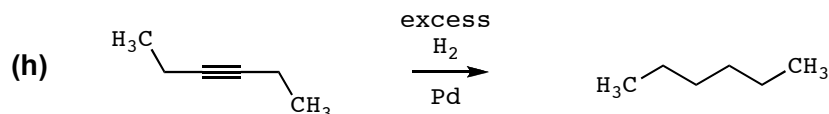
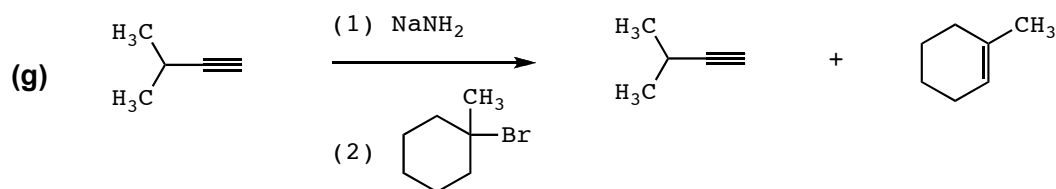
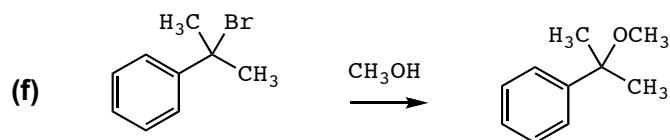
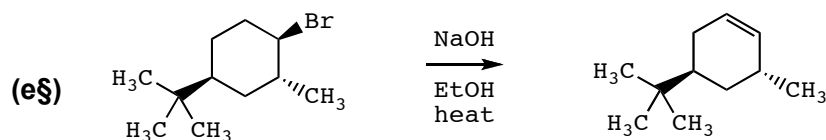
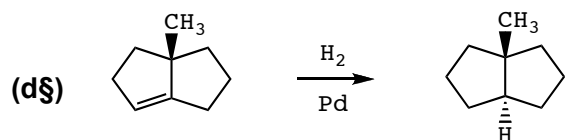
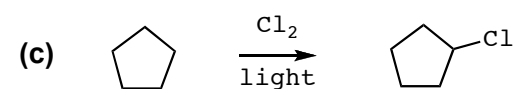
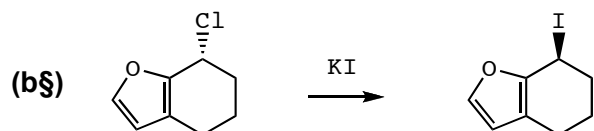
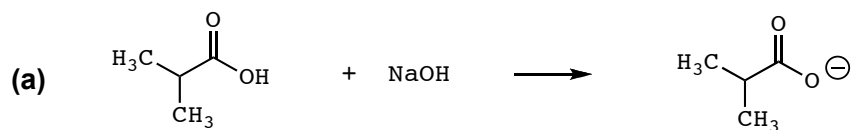
D



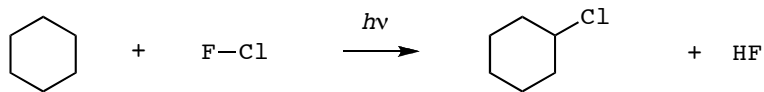
A



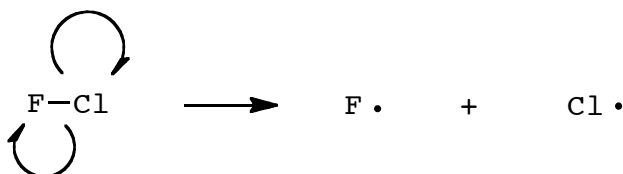
(7) Draw the structure of the major organic product of these reactions and reaction sequences; in those reactions marked §, clearly show the stereochemistry of the product using dashed-and-wedging. Do not present mechanisms. **Note** Reaction sequence (g) produces two organic products: draw both of them. (27 points)



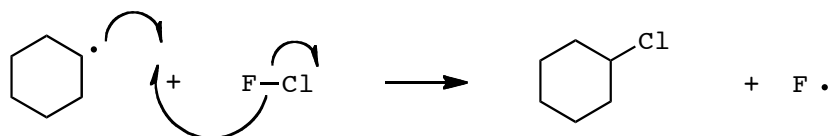
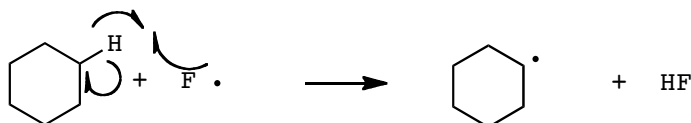
(8) The reaction shown below takes place by a radical mechanism. In the spaces provided present the mechanism: write initiation, propagation, and two termination steps. (10 points)



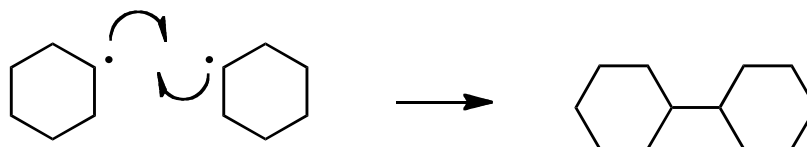
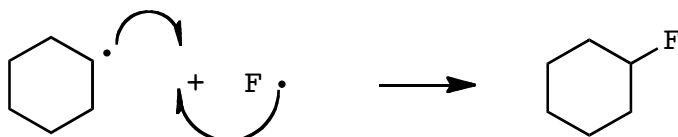
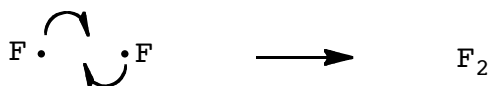
Initiation



Propagation



Termination (write two termination steps)



(9) Propose a sequence of reactions that efficiently converts the indicated starting material(s) to the target molecule. Show the reagents needed in each step and draw the product formed after each step. Do not present mechanisms. (6 + 6 = 12 points)

