Hour Exam #1
Chemistry 343
Professor Gellman
6 October 2010

Last Name Answer

First Name Key

General Instructions:

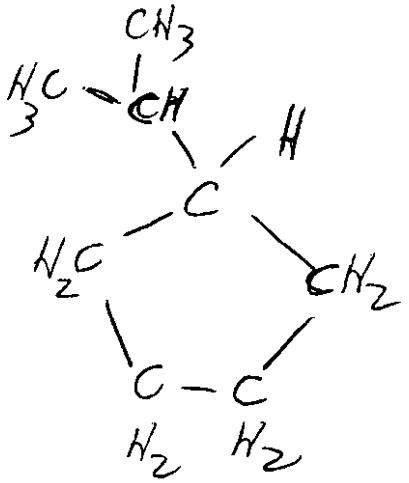
(i) Use scratch paper at back of exam to work out answers; final answers must be recorded at the proper place on the exam itself for credit. Models are allowed.

(ii) Print your name on each page.

(iii) Please keep your paper covered and your eyes on your own work. Misconduct will lead to failure in the course.

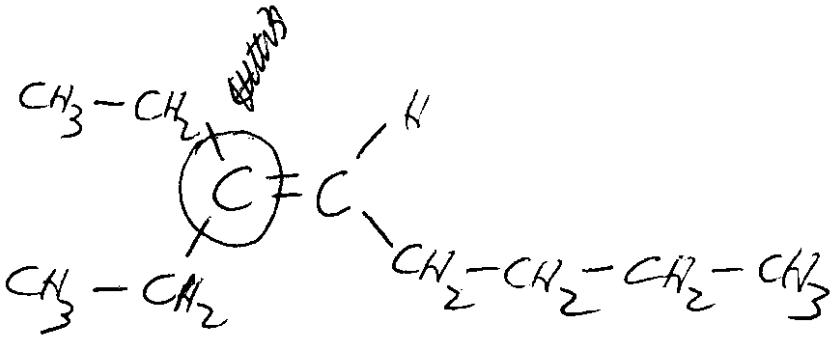
1. (10 points) Draw a structure that corresponds to the following name. Show all atoms in your structure, including H atoms.

(a) isopropyl-cyclopentane



+5

(b) 3-ethyl-3-octene



+5

any wrong ⇒ 0 point!

Name _____

2. (13 points) Shown below are the structures of two drugs that are widely used to treat diabetes, rosiglitazone (Avandia) and pioglitazone (Actos), which act by increasing sensitivity to insulin. These two have been in the news lately because of recent FDA actions based on heart problems experienced by some patients who use rosiglitazone.

Rosiglitazone is highlighted in the box. For <u>this</u> molecule, carry out the following instructions.

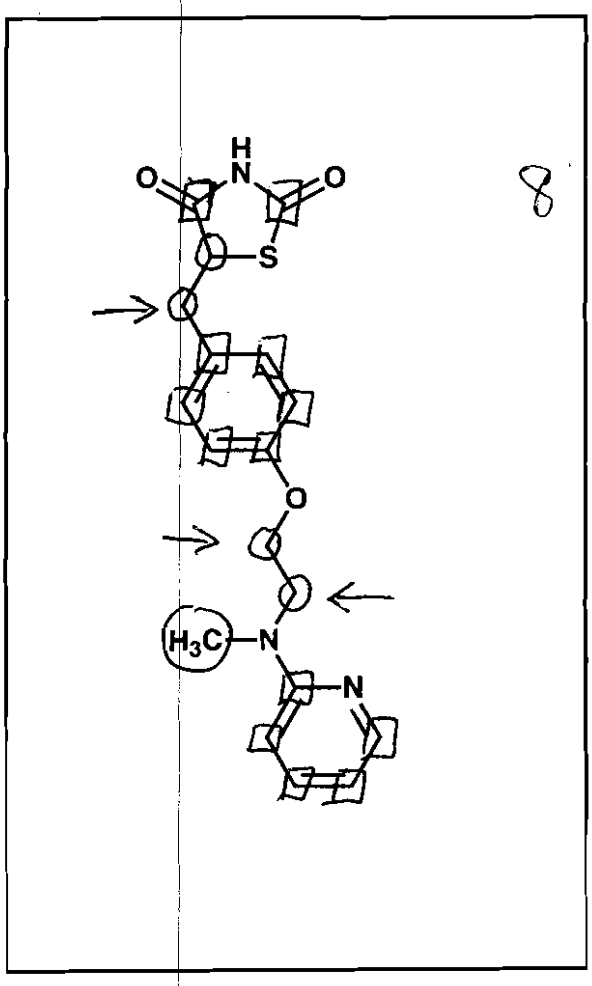
(a) Using an arrow (-->) indicate two carbon atoms that have two hydrogens as bonding partners.

(b) Indicate with a CIRCLE three carbons with sp^3 hybridization.

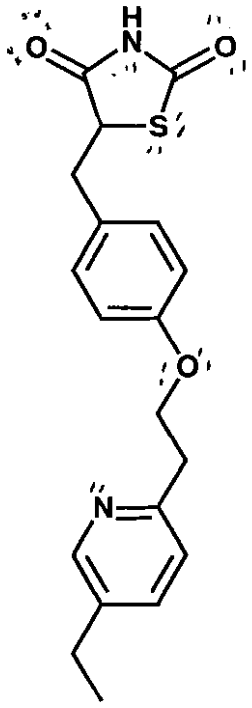
(c) Indicate with a SQUARE three carbons with sp^2 hybridization.

For pioglitazone (no box), draw in ALL LONE PAIRS that are implied by the structure.

2 x correct → = 2 pts
3 x correct ○ = 3 pts
3 x correct □ = 3 pts



8



+1 pt for each 2 correct lone pairs

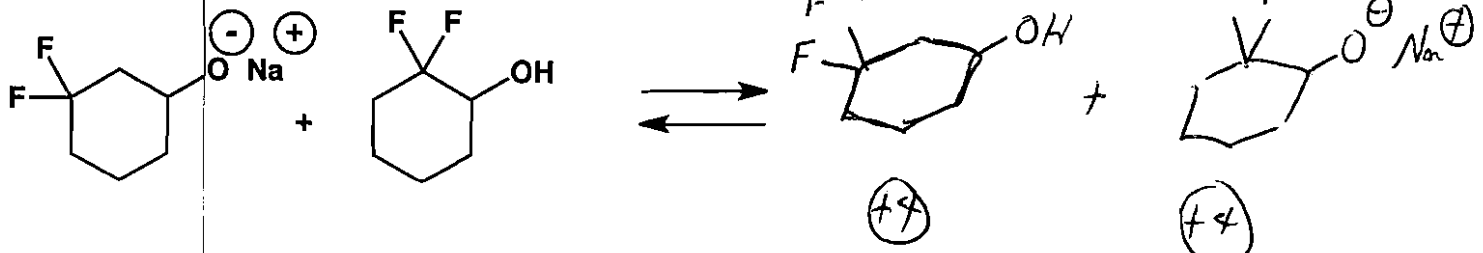
(5 pts total)

7

Name _____

3. (14 points)

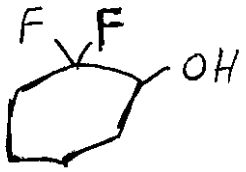
(a) Draw in the other side of the acid-base equilibrium below.



+4 +4

-2 if basic concept is correct but messed up Na position

(b) Of the two acids in the equilibrium above, draw below the acid with the lower pKa.



+4

-2 if missing counterion

(c) Which side of the equilibrium above should be favored? (Circle one answer below.)

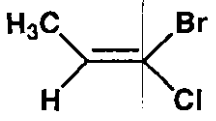
LEFT RIGHT +2

No credit if blank above

-2 if missing charge

-2 if Na is in wrong place on molecule

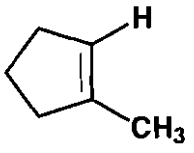
4. (9 points) For each structure below, indicate the alkene stereochemistry by circling the correct choice.



E (Z) Neither

(circle one)

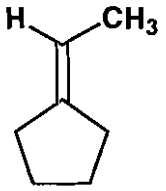
+3



E (Z) Neither

(circle one)

+3



E Z (Neither)

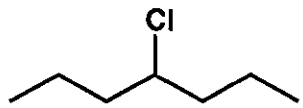
(circle one)

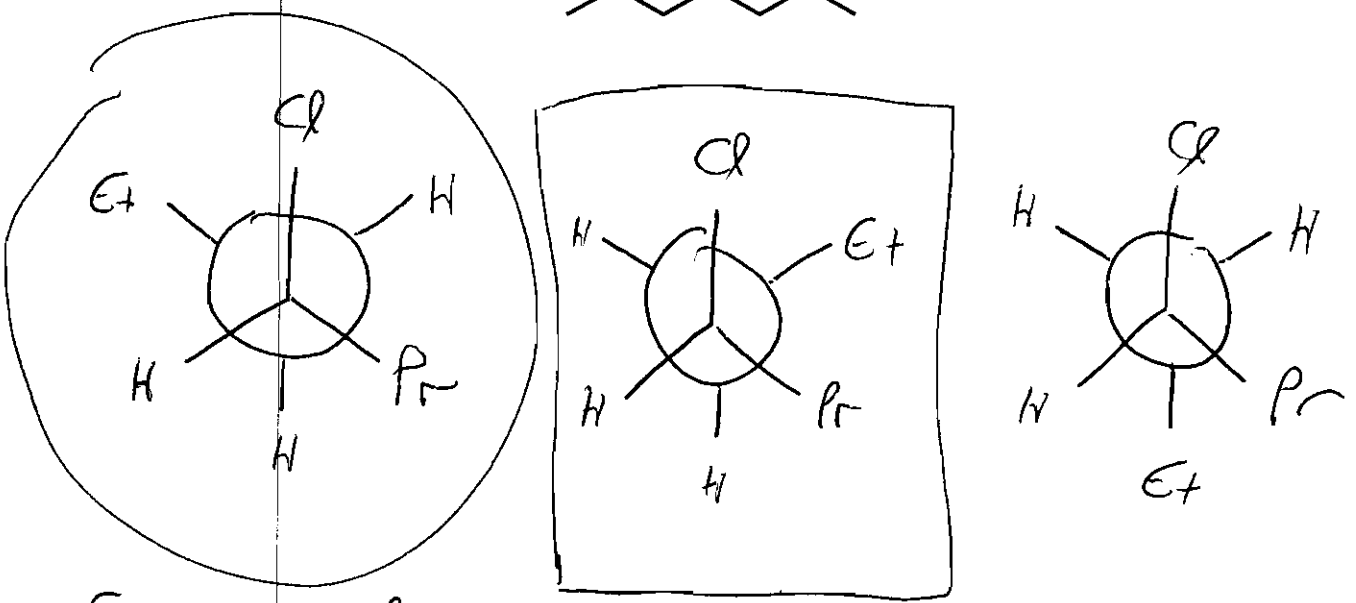
+3

Name _____

5. (20 points) For the molecule shown below (4-chloro-heptane), draw Newman projections for one bond that involves the carbon bearing the chlorine atom; draw all possible staggered conformations about this bond.

Given that chlorine is smaller than a methyl group, CIRCLE the staggered conformation that you would expect to be <u>most</u> stable. Put a SQUARE around the staggered conformation that you would expect to be <u>least</u> stable.





[Pr = propyl = $-CH_2CH_2CH_3$]

[Et = ethyl = $-CH_2CH_3$]

+4 for each correct Newman projection (+12 total)

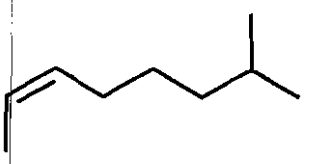
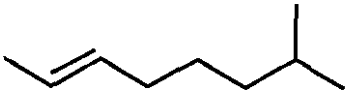
+4 for correct ○

+4 for correct □

Name _____

6. (16 points) Consider the two alkene pairs below, (1) and (2). In one case, comparing the heats of combustion provides direct insight on the thermodynamic impact of double bond geometry, but in the other case a direct comparison of heats of combustion is not useful.

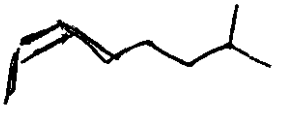
(1)  vs.

(2)  vs. 

(a) For which case [(1) or (2)] is the comparison of heats of combustion NOT useful? Briefly explain your choice (your explanation should require only a sentence of two).

Comparison of the two molecules in (1) is not useful because these molecules are not isomers. (+8)

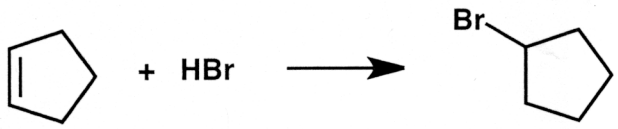
(b) For the case in which the comparison of heats of combustion IS useful, which isomer should have a LARGER heat of combustion? Briefly explain your choice (your explanation should require only a sentence of two).

+4 (conceptual)
Heat is released upon combustion of a hydrocarbon. Therefore, in (2),  should have the larger ΔH_c because the Z alkene geometry means (+4) that this isomer is less stable (higher in energy) than the E isomer. (+8)

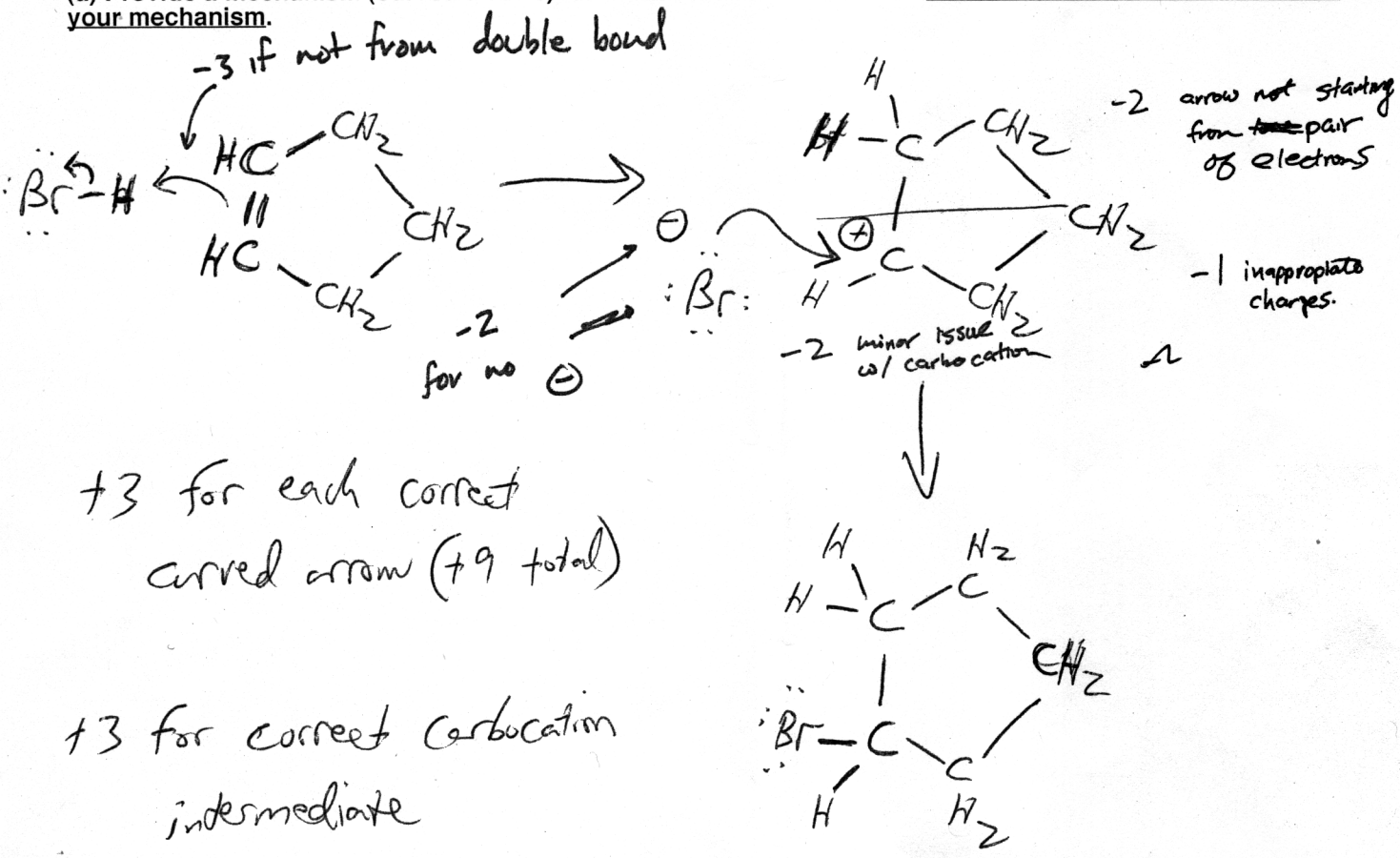
right w/no explanation = +2

Name _____

7. (18 points) Consider the following reaction.



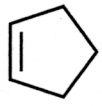
(a) Provide a mechanism (curved arrows) for the reaction shown above. Show all atoms in each structure in your mechanism.



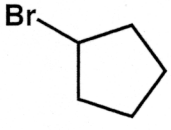
+3 for each correct curved arrow (+9 total)

+3 for correct carbocation intermediate

(b) Give the degree of unsaturation (U) for the starting material and product of the reaction above.



U = 2 (+3)



U = 1 (+3)