Hour Exam #1 (AM)
Chemistry 343
Professor Gellman
5 October 2011

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.

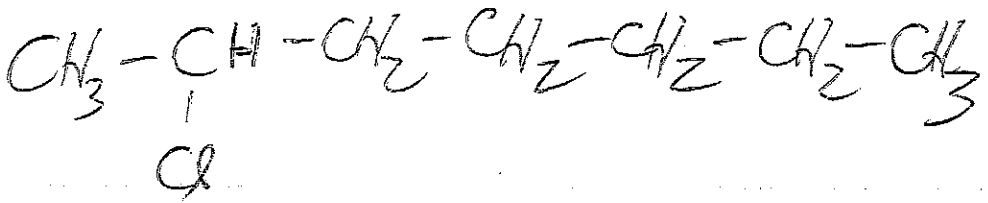
(ii) Print your name on each page.

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

1. (15 points) Draw a structure that corresponds to each of the following names. Show all atoms in each structure, including hydrogen atoms.

(a) 2-chloroheptane

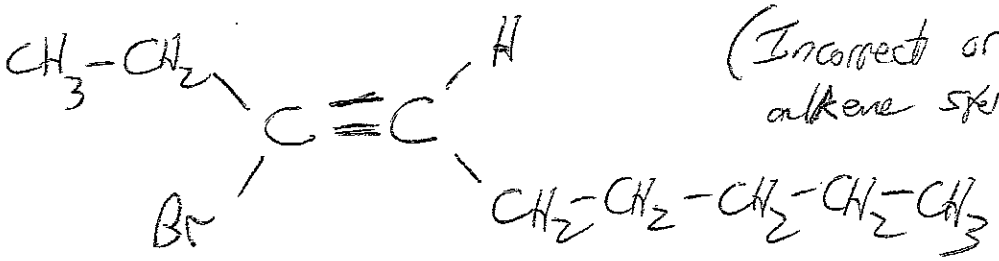
+5



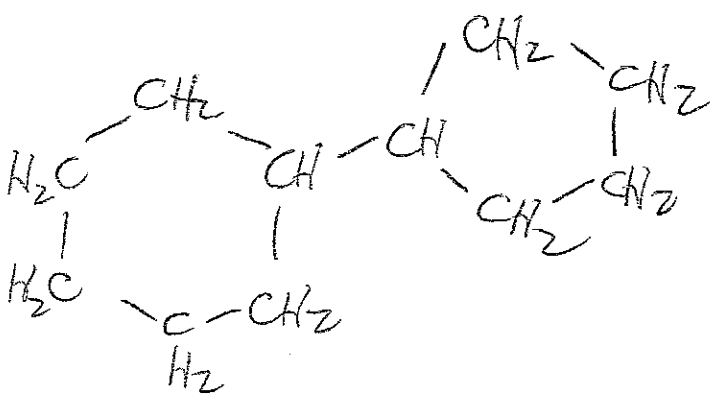
(b) *Z*-3-bromo-3-nonene

+5

(Incorrect or unclear alkene stereochem +3)



(c) cyclopentyl-cyclohexane

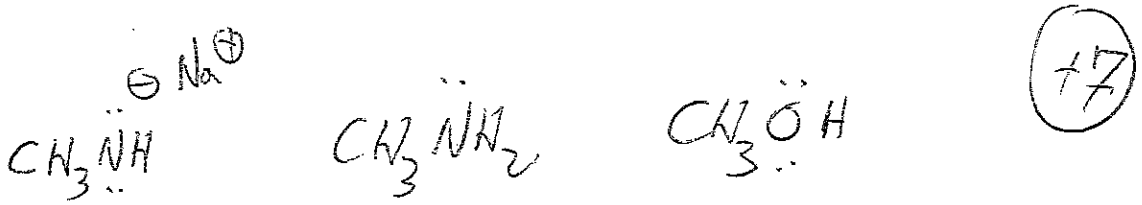


+5

Name _____

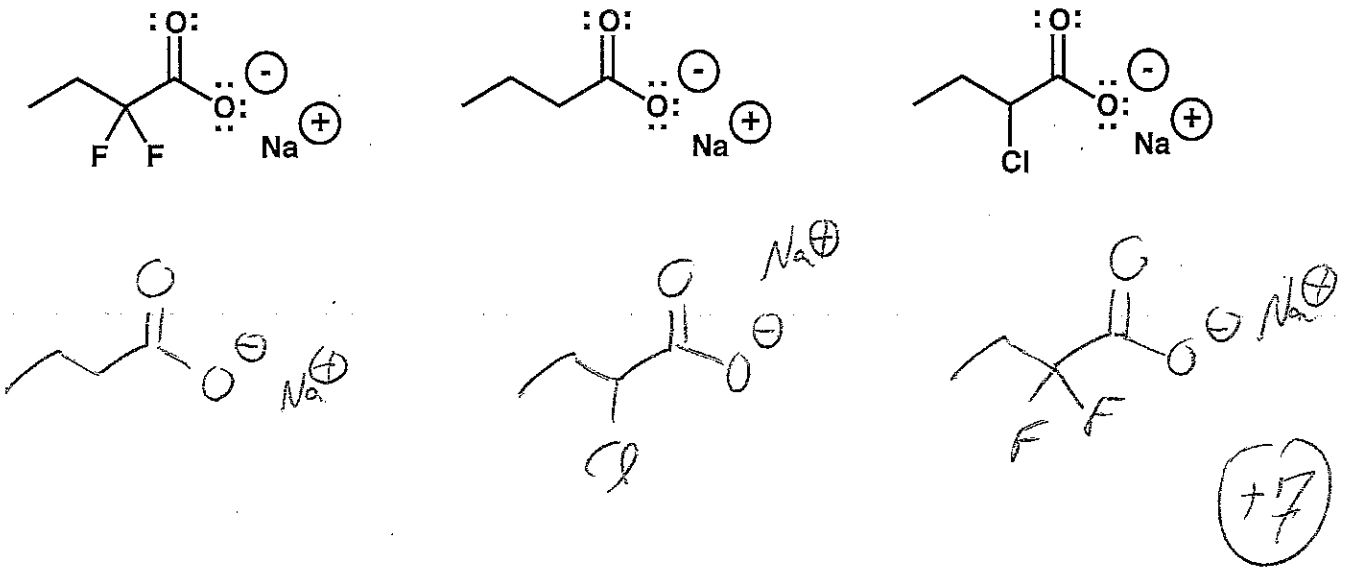
2. (14 points) For each set of structures shown below, redraw the structures in the order of DECREASING basicity, left to right. (Note: Negative charges are balanced by a sodium (Na) counterion (positive charge).)

(a) CH_3NH_2 CH_3OH CH_3NH^- Na^+



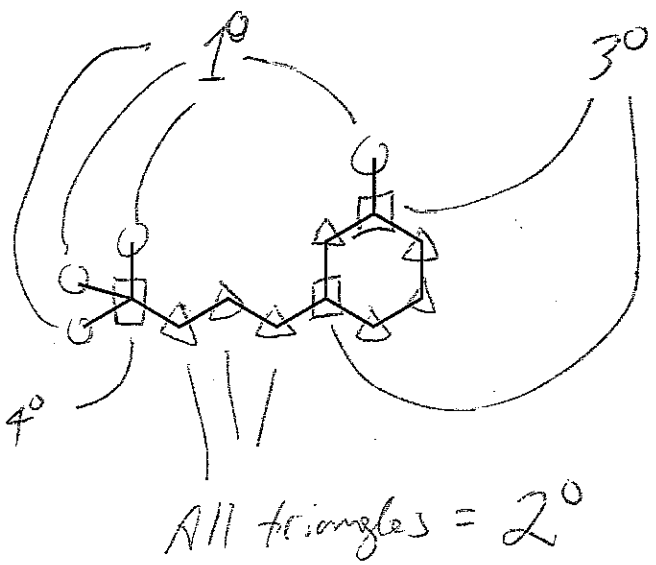
+7

(b)



+7

3. (7 points) On the structure shown below, indicate for EACH CARBON ATOM whether that atom is 1°, 2°, 3° or 4°.



+1 for every 2 correct

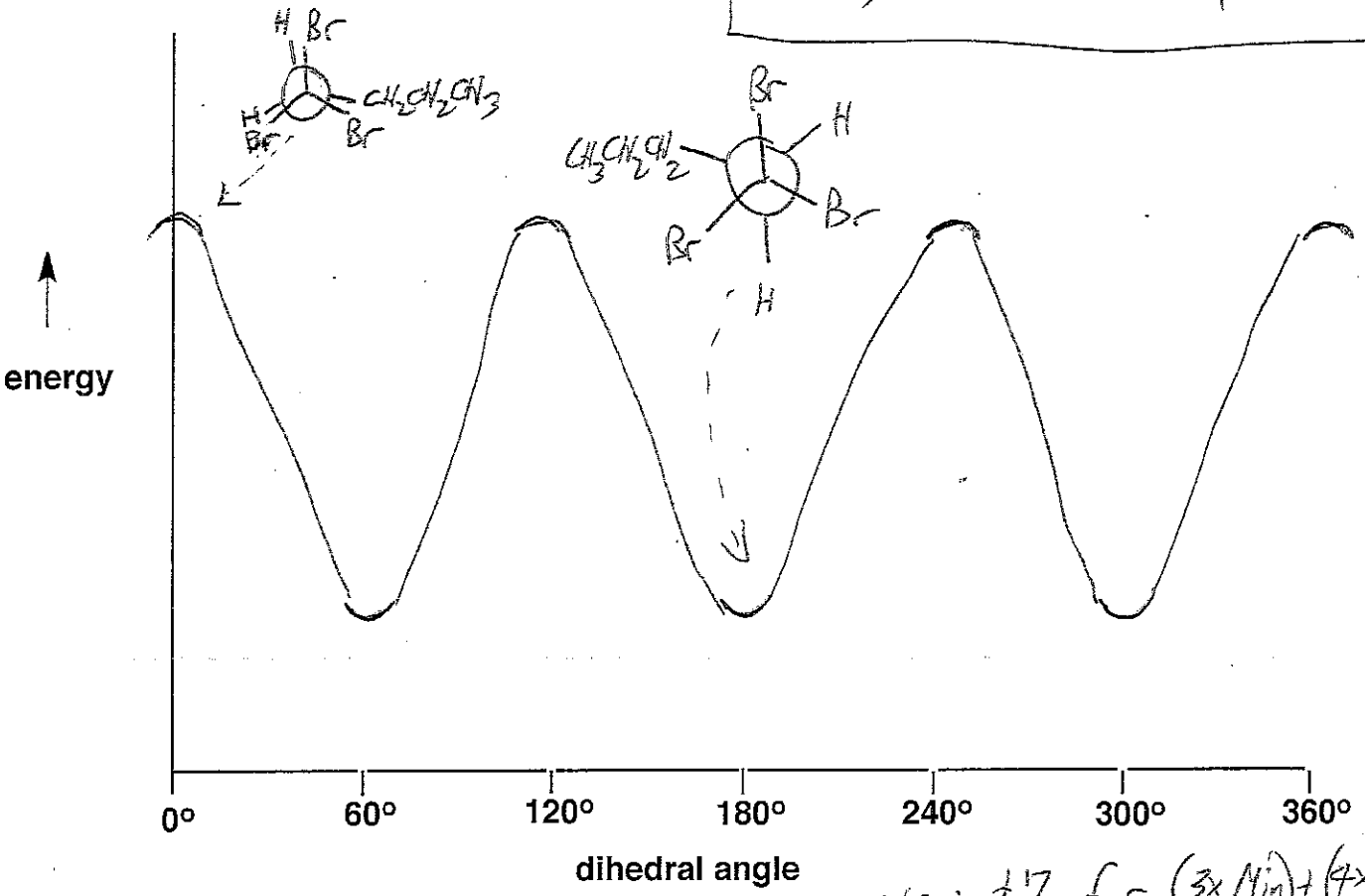
Name _____

4. (20 points)

(a) Shown below is 1,1,1-tribromopentane; draw the energy diagram for rotation about the bond between carbon-1 and carbon-2. Provide an appropriate drawing to identify at least one maximum and at least one minimum in this energy function.

+4 each for correct staggered (min) and correct eclipsed (max)

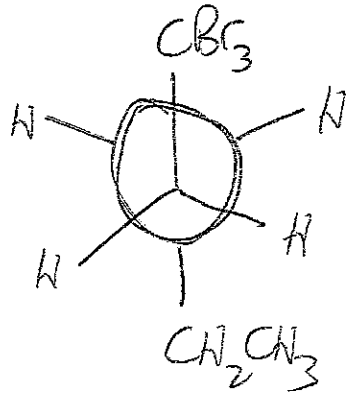
$CBr_3CH_2CH_2CH_2CH_3$



Curve: +7 for (3x Min) + (4x Max)
-2 if all Min's not same
-2 if all Max's not same

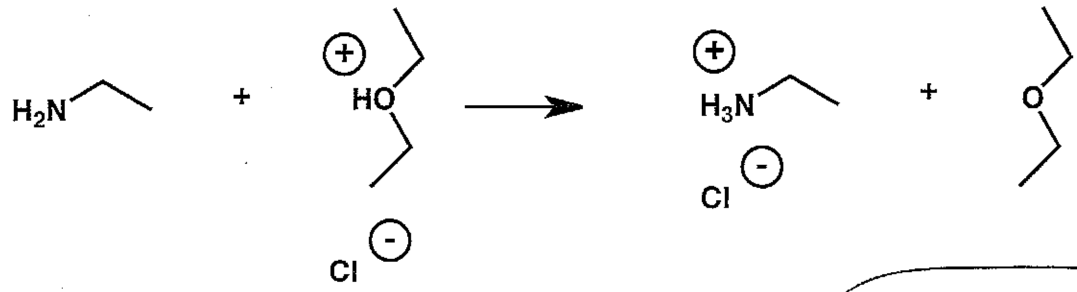
(b) Draw a Newman projection of the most stable conformation about the bond between carbon-2 and carbon-3.

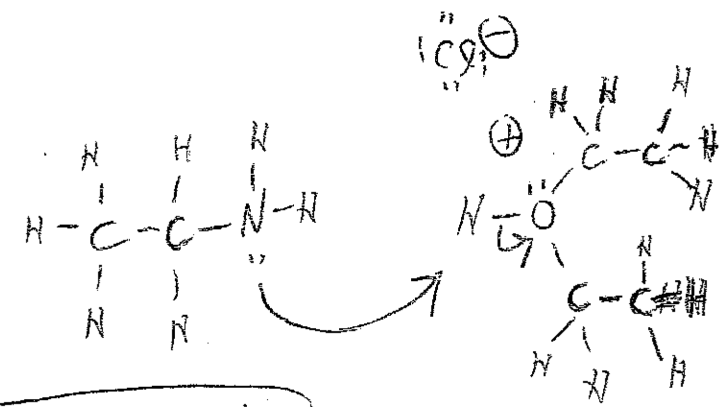
+5



Name ________________

5. (14 points) Provide a mechanism (curved arrows) for the reaction shown below. <u>Show all atoms, bonds and lone pairs in each structure in your mechanism</u>. [Note: The chloride counterion is just a 'bystander' in this process.]



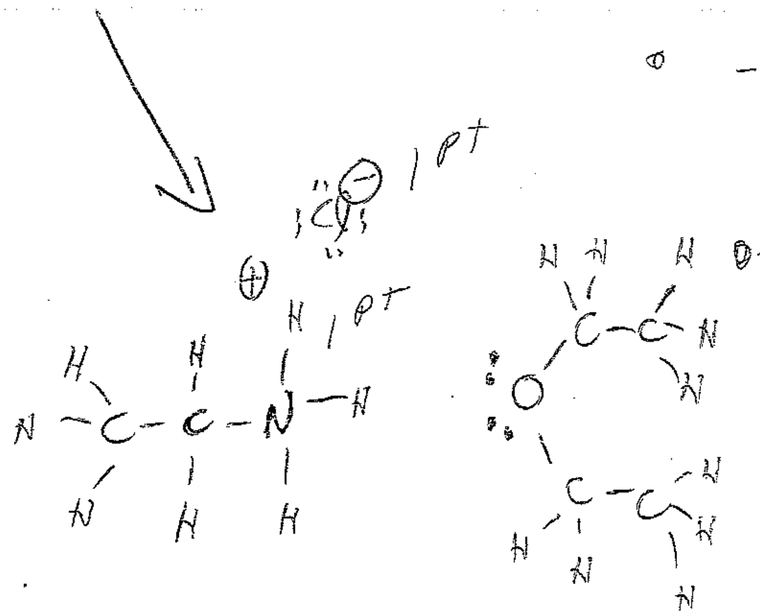


Each correct structure = +2 (+8 total)

- −2 pt wrong structure
- −1 pt missing charge
- −1 pt total if drew in H on original but forgot to indicate ⊕
- $H_2N-CH_2-CH_3$ etc are OK

Each correct curved arrow = +3 (+6 total)

−3 pts wrong arrow



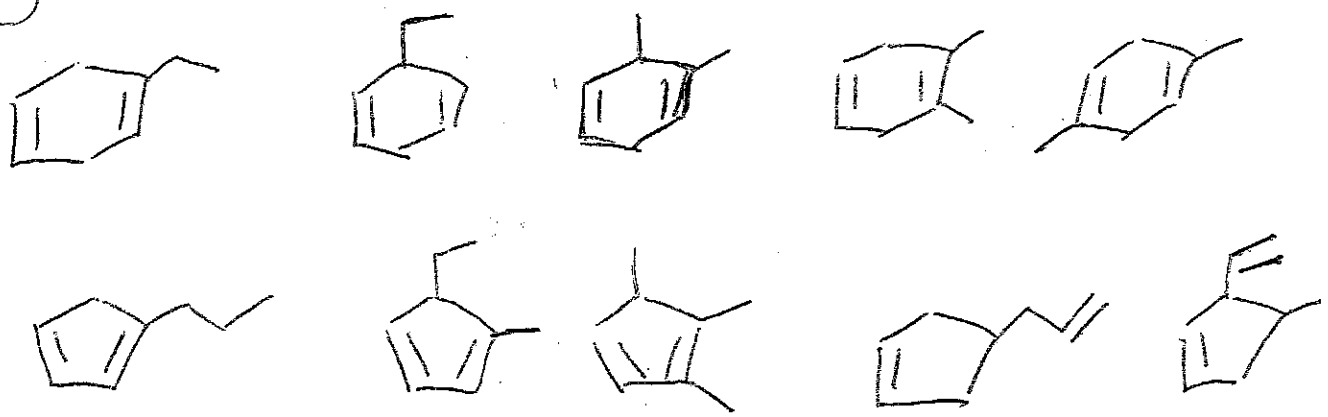
Name _____

6. (30 points)

(a) A hydrocarbon with the formula C_8H_{12} is exposed to excess H_2 in the presence of Pd/C as catalyst. TWO equivalents of H_2 are consumed, to generate a product with formula C_8H_{16} (this product does not react further with H_2 in the presence of Pd/C).

Propose THREE possible structures for the starting material C_8H_{12} (via appropriate drawings).

Many possible correct structures (2 π-bonds + 1 rng)
(+5) for each correct structure. Examples:



(b) A different hydrocarbon with the formula C_8H_{12} is exposed to excess H_2 in the presence of Pd/C as catalyst. ONE equivalent of H_2 is consumed, to generate a product with formula C_8H_{14} (this product does not react further with H_2 in the presence of Pd/C).

Propose THREE possible structures for the starting material C_8H_{12} (via appropriate drawings).

Multiple correct possibilities (1 π-bond, 2 rngs). Violations of Bredt's rule ok. (+5) for each correct structure. Examples: