CHEM 346 – Organic Chemistry I (for Majors)

Instructor: Paul J. Bracher

Practice Hour Examination #1-2

Monday, September 23rd, 2013
1:10 p.m.

Student Name (Printed)	
Student Signature	

Please also write your name on the back of the exam

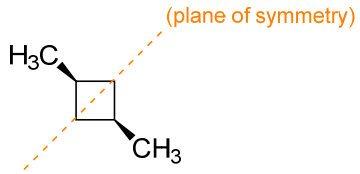
Scoring

Question	Points Earned	Points Available
1		15
2		15
3		24
4		56
TOTAL		110

Problem 1. (15 points total, 3 points each) Determine whether the following five statements are true or false. Write out the full word "true" or "false" beside each statement; do not just write "T" or "F". If any part of the statement is false, the entire statement is false.

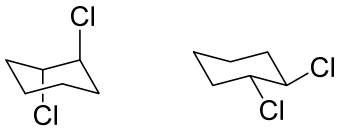
(i) _____ There are 16 stereoisomers of the compound 3,5-dibromo-2-chloro-6-fluoroheptane.

(ii) _____ Compound **A** has no stereoisomers, only constitutional isomers.



A

(iii) _____ Compounds **B** and **C** will have the same melting points and boiling points, but will rotate plane-polarized light in opposite directions.



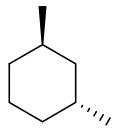
B **C**

(iv) _____ A 3:1 mixture of (*R*)-2-bromobutane and (*S*)-2-bromobutane has an enantiomeric excess (e.e.) of 50% and is optically active.

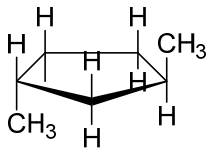
(v) _____ The *cis* isomer of 1,4-dimethylcyclohexane lies in a higher state of potential energy than the *trans* isomer.

Problem 2. (15 points total, 5 points each) For each question, select the best answer of the choices given. Write the answer, legibly, in the space provided.

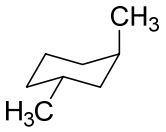
(i) _____ Which of the following structures is a valid representation of (*S*,*S*)-1,3-dimethylcyclohexane?



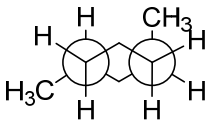
(a)



(b)



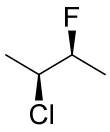
(c)



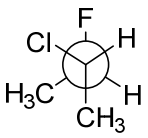
(d)

(e)

(ii) _____ The compounds represented by Lewis structure **D** and Newman projection **E** are:



D



E

(a) identical compounds
(b) enantiomers
(c) diastereomers
(d) constitutional isomers
(e) conformers

(iii) _____ On the imaginary Planet Billiken, the ambient temperature on the surface of the planet is not high enough to provide the energy necessary for molecules to overcome the barrier to rotation between staggered conformations. How many distinct, pure isomers (including stereoisomers) with the molecular formula C_4H_{10} could you isolate on Billiken?

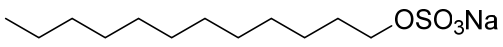
(a) 2
(b) 3
(c) 4
(d) 5
(e) 6

Problem 3. (24 points total) Short answer.

(i) (6 points) Draw an isomer of C_5H_8 that your textbook would say is not a Lewis base.

(ii) (8 points) Draw the lowest-energy chair conformation of (1*S*,3*R*)-1-*tert*-butyl-3-isobutylcyclohexane.

(iii) (10 points) Explain in five sentences or fewer how a surfactant like sodium dodecyl sulfate (SDS) helps improve the solubility of alkanes in aqueous media (e.g., water). Feel free to draw a picture.



sodium dodecyl sulfate

Problem 4. (56 points total) Isomers of C_8H_{18}.

(i) (36 points) Draw all of the constitutional isomers that have a molecular formula of C_8H_{18}. Hint: there are 18 constitutional isomers (not counting stereoisomers).

(ii) (8 points) Draw the pair of enantiomers of C_8H_{18} that have both a stereocenter and a quaternary (4°) carbon. Write the name of each compound below its structure.

(iii) (6 points) Identify the only stereoisomer of C_8H_{18} that is a meso compound.

(iv) (6 points) Identify the one isomer of C_8H_{18} that is a solid at room temperature.