

CHEM 2430 – Organic Chemistry I – Fall 2015

Instructor: Paul Bracher

Quiz #2Due: Monday, September 14th, 2015

1:10 p.m. (in class)

Student Name (Printed)	
Student Signature	

Instructions & Scoring

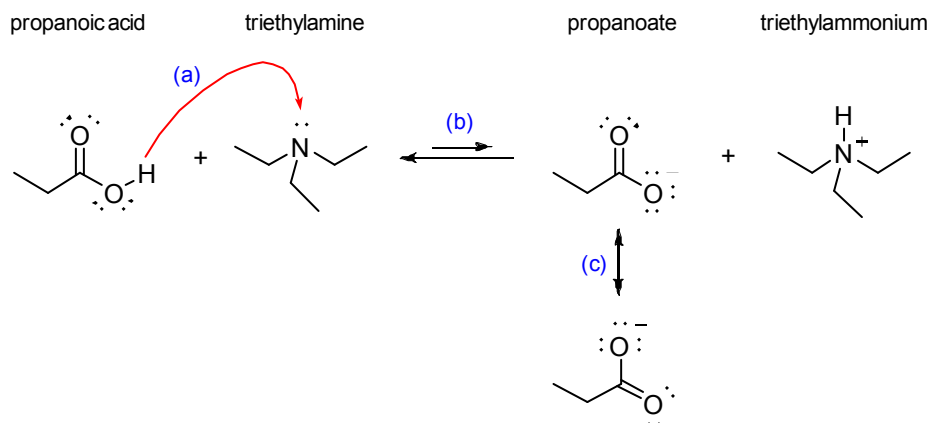
- Please write your answers on the official answer sheet. No answers marked in this booklet will be graded. Submissions submitted electronically will not be graded.
- You may use any resources you wish and collaborate with others.
- Any questions should be posted to the Blackboard discussion board so all students have equal access to the information.
- Your quiz answer sheet may be photocopied.

Problem	Points Earned	Points Available
I		30
II		20
III		10
IV		10
V		30
TOTAL		100

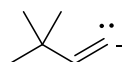
Exam #1 is on Wednesday, September 16th!

Problem I. Multiple choice (30 points total; +5 points for a correct answer, +2 points for an answer intentionally left blank, and 0 points for an incorrect answer). For each question, select the best answer of the choices given. Write the answer, legibly, in the space provided on the answer sheet.

- (1) _____ Which of the following statements best describes the use of the arrows labeled (a), (b), and (c) in the acid–base reaction depicted below?



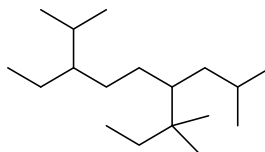
- (a) arrow (a) is used incorrectly
 (b) arrows (b) are used incorrectly
 (c) arrow (c) is used incorrectly
 (d) arrows (a) and (b) are used incorrectly
 (e) arrows (a), (b), and (c) are all used incorrectly
- (2) _____ Which of the following statements is not true of the anion represented by structure **A**.



A

- (a) anion **A** has 11 hydrogen atoms
 (b) anion **A** would react with a weak acid to form an alkene
 (c) anion **A** has one sp -hybridized carbon atom
 (d) anion **A** has four sp^3 -hybridized carbon atoms
 (e) anion **A** has a quaternary carbon atom

(3) _____ What is the systematic name of compound **B**?



B

- (a) 4-isopentyl-7-isopropyl-2-methylnonane
- (b) 3-ethyl-6-isobutyl-2,7,7-trimethylnonane
- (c) 6-isobutyl-3-isopropyl-7,7-dimethylnonane
- (d) 7-ethyl-4-isobutyl-3,3,8-trimethylnonane
- (e) none of the above

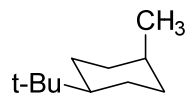
(4) _____ Which of the following statements is not true of compound **C**.



C

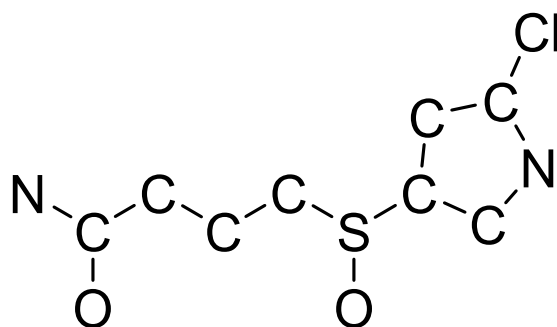
- (a) compound **C** is named 2,2-dimethylpropane
- (b) compound **C** has the lowest melting point of any isomer of C_5H_{12}
- (c) compound **C** is a saturated hydrocarbon
- (d) compound **C** has only sp^3 -hybridized carbon atoms
- (e) compound **C** is an isomer of 2-methylbutane

- (5) _____ Which of the following statements is not true of the molecule represented by structure **D**?

**D**

- (a) the only intermolecular van der Waals forces between molecules of **D** are London forces
- (b) every C–C–C bond angle in **D** is $109.5 \pm 10^\circ$
- (c) structure **D** represents the most stable chair conformation of the molecule
- (d) the methyl group is located at the 4 position of the ring
- (e) the combustion of 1 mole of **D** in an oxygen atmosphere produces 11 moles of water
- (6) _____ How many hydrogen atoms are in the smallest (lowest mass), acyclic alkane that has at least one primary, one secondary, one tertiary, and one quaternary carbon?
- (a) 10
- (b) 14
- (c) 16
- (d) 18
- (e) 20

Problem II. Lewis Structure (20 points). Complete the Lewis structure for compound E, shown below. The compound has the molecular formula $C_8H_{11}ClN_2O_2S$. The sulfur atom has a formal charge of +1, and its adjacent oxygen atom has a formal charge of -1. There are no other formal charges in the structure. All of the carbon atoms in the ring are sp^2 -hybridized. Among other features, the compound has an amide functional group and a secondary amine. Explicitly include—i.e., draw out—all hydrogen atoms, bonding pairs, lone pairs, and non-zero formal charges on your Lewis structure. The molecule has been started on your answer sheet.



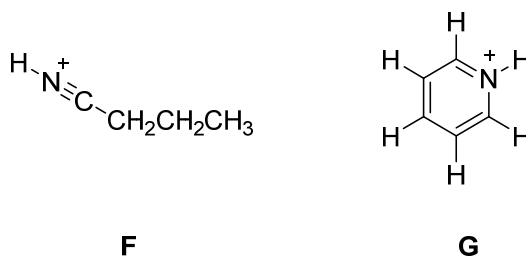
E

Problem III. Short Answer (10 points). Among all neutral (uncharged) hydrocarbons in which every carbon atom possesses a full octet of valence electrons, draw the structure of the smallest (by mass) compound that possesses at least one sp -hybridized carbon atom, one sp^2 -hybridized carbon atom, one sp^3 -hybridized carbon, one C–C single bond, one C=C double bond, and one C≡C triple bond. If there are multiple structures that meet these criteria, draw the compound with the highest pK_a . Your structure should not have any bond angles that deviate far from the ideal values for any particular hybridization of carbon.

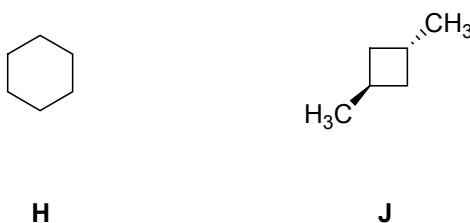
Problem IV. Isomers of Alkanes (10 points). Provide the systematic IUPAC name of the stable isomer of molecular formula $C_{10}H_{22}$ for which the sum of all the locants is the highest. That is, for all of the compounds with molecular formula $C_{10}H_{22}$, which has the name in which all of the numbers add up to the highest value? Write your answer in the box on the answer sheet.

Problem V. Explanations (30 points). For each question posed below, write the letter of your answer in the box on the answer sheet and provide a brief explanation (of no more than four sentences) for your choice. You should draw out any relevant resonance forms if the concept factors into your explanation.

(1) (10 points) Of compounds **F** and **G**, which is the more acidic?



(2) (10 points) Of compounds **H** and **J**, which has the more negative heat of combustion—i.e., for which compound is combustion more exothermic?



(3) (10 points) Of compounds **K** and **L**, which has the higher boiling point?

