Exam 1 Chem 3045x Friday, September 29, 2000

Instructions:  This is an closed book examination. Please print your name and social security number on the front page of the examination. Be sure to allot your time in a manner that is related to the point value of the question. Be sure to show your reasoning wherever possible for partial credit.

All material to be graded must be on one of the pages of the exam with your name and social security number on the front page. If you need more space than is available on the page with the questions, use the back page or the previous page and label the number of the question on that page.

Your Name: ________________________________

Your Soc. Sec. Number: ______________________

Time for the exam:  50 minutes (10:00 to 10:50 AM).

  Question 1:  15 points __________
  Question 2:  15 points __________
  Question 3:  15 points __________
  Question 4:  10 points __________
  Question 5:  10 points __________
  Question 6:  10 Points __________
  Question 7:  10 Points __________
  Question 8:  15 Points __________

Total:  100 Points __________
1. (15 Points) Consider the composition \( \text{CH}_2\text{N}_2 \) and the constitution \( \text{A} \) shown below.

\[
\begin{align*}
\text{H} & \quad \text{C} \quad \text{N} \quad \text{N} \\
\text{H} & \\
\text{A}
\end{align*}
\]

(a) Draw all of the acceptable significant contributing Lewis structures obeying the octet rule for this constitution, showing explicitly all formal charges.

(b) Draw a circle about the structure that makes the greatest contribution to the resonance hybrid.

(c) Indicate your reasoning for your selection of the major contributing structure.
2. (15 Points). Shown below are Lewis structures and curved arrows which indicate rearrangements of the valence electrons which will generate a new Lewis structure.

(a) Draw the new Lewis structure that is generated by the operation of the curved arrows.

(b) Draw a circle around the structure that will contribute most to the resonance hybrid.

(c) Briefly indicate briefly the reasoning for your selection.

\[
\begin{align*}
\text{H} & \quad \text{C} & \quad \text{C} & \quad \text{N} & \quad \text{H} \quad \text{H} \\
\text{H} & \quad \text{H} & \quad \text{H} & \quad \text{H} & \quad \text{H} \\
\text{HO} & \quad \text{CH} & \quad \text{CH} & \quad \text{CH}_2
\end{align*}
\]
3. (15 Points). There are 5 possible constitutional isomers of the composition \( \text{C}_6\text{H}_{14} \).

(a) Draw Lewis structures of all of the constitutional isomers of the composition \( \text{C}_6\text{H}_{14} \).

(b) Draw a circle around the structure that corresponds to the isomer with the highest boiling point.

(c) Indicate the reasoning for your answer to (b).
4. (10 points). Draw clearly a Newman projection structure for the most stable conformation of 1,2-dibromoethane. Do you expect this conformation to possess a dipole moment? Explain.

5. (10 points). Draw a circle around the more stable stereoisomer of the following pair. Give the reasoning for your choice.

A

B
6. (10 Points). Consider three constitutional isomers (A, B, and C) corresponding the composition C₅H₁₂. Upon treatment of each with Cl₂ and light, a reaction occurs to produce, among other products, monochlorides of composition C₅H₁₁Cl. Deduce the Lewis structure of each isomer from the following information:

A yields three isomeric monochlorides, B yields four isomeric monochlorides and C yields 1 monochloride (no isomers).

(a) The Lewis structure of A is: 

(b) The Lewis structure of B is: 

(c) The Lewis structure of C is:
7. (10 Points) Classify each of the following pairs of structures as (a) conformers; (b) constitutional isomers; (c) stereoisomers; (d) identical structures. Put your answer in the box to the right of the structures.