CHE 230 - Organic Chemistry
Exam 1, February 12, 2003

Name_________________ Student ID No._________________

Before you begin this exam: First: You are allowed to have a simple model set at your seat. Please put away all other materials. Second: Place your student identification on your desk. A proctor will come around to check everyone’s ID. Third: Read through the entire exam. Your goal, as always, is to score as many points as possible. Fourth: It is critically important that your answers be written in a clear, unambiguous manner. Answers in which your intentions are unclear will not receive credit. Fifth: READ THE INSTRUCTIONS FOR EACH PROBLEM. You have until 9:50 to complete this exam. There will be no extensions, so budget your time carefully.

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1. (11 points) Draw the Lewis dot structure of methylisocyanate. Be sure to use dots to signify all outer-shell electrons.

   ![Lewis dot structure of methylisocyanate]

   *Methylisocyanate*

2. (9 points) Draw three compounds with molecular formula C₇H₁₂ that are skeletal isomers. There are many right answers. If you write more than three, only the first three will be graded.

3. (15 points) Draw 3 new resonance forms for N-methylamino anisole (below). Use the correct arrow to denote resonance forms and (correctly) use arrows to show the motion of electrons.

   ![Resonance forms for N-methylamino anisole]
4. (12 points) Provide the IUPAC name for each of the following. Use the \( E, Z \) convention to denote the configuration of C=C bonds (where appropriate).

![Chemical Structure Image]

5. (12 points) Draw a Newman projection of the most stable conformation of 2-methyl butane, sighting down the C2-C3 bond. On your drawing, indicate a gauche arrangement.

![Newman Projection Image]
6. (10 points) Determine the state of hybridization at the indicated atoms.

a) Testosterone

b) Caffeine

This carbon is _____ hybridized.
This oxygen is _____ hybridized.

This nitrogen is _____ hybridized.

This nitrogen is _____ hybridized.

7. (6 points) Which of the following structures are chiral? (Circle the chiral structures)

8. (8 points) Circle the stereogenic carbons in the compound below.

Oxycodone
9. (8 points) Assign the R,S configuration to the stereogenic carbons in the compounds below.

a)

\[ \text{ } \]

b)

\[ \text{ } \]

10. (9 points) In the series of compounds below there is a significant trend in the importance of resonance. In the 3-membered ring, the lone pair on nitrogen is not significantly involved in resonance with the adjacent C=O \( \equiv \)-bond. As the ring size increases, that resonance interaction becomes more important. In the space provided, provide an explanation for this trend.

\[ \text{ } \]