PRINT your name legibly on the line below.

[Signature: Key]

PRINT your student id number on the line below.

[Signature: Key]
2005 Organic Chemistry CHE230-001 EXAM 1

Name: _______________________________ Student ID No:_____________________

Place your student identification on your desk. A proctor will come around to check your ID. **Put your name and number on your test?**
It is critically important that your answers be written in a clear, unambiguous manner. Answers in which your intentions are unclear may not receive credit. **SHOW YOUR WORK!**

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**Total** 100 _____
Problem 1.

1. (15 pts.) Draw the addition product above.

2. a) (10 pts.) Calculate the degrees of unsaturation in the following formula. Show your work!

   \[ C_9H_{16}NOCl \]
   \[ 9 - \frac{17}{2} + \frac{1}{2} + 1 = 2 \]

   b) (5 pts.) Based on your answer, if there are no p orbitals in the molecule, how many rings does the molecule have?
   
   \[ 2 \]

3. (15 pts.) Provide one or two words that state how these isomers are related.

   a) diastereomers
   b) geometric isomers
   c) enantiomers
4. (12 pts.) Below DRAW and NAME an isomer of C₃H₆Cl₂ that has a stereogenic atom with **S absolute configuration.** Whatever structure you draw has to be an isomer of the given formula and you have to name the structure you draw to receive any credit.

Structure:

Molecule name: **(2S)-1, 2-dichloro propane**

5. (10 pts.) How many carbon NMR signals are there in the following molecules?

6. (10 pts.) a) How are the C-N bonds hybridized in 5a at the N atom? **sp²**

b) How is the sigma bond between carbon atom numbers four and five hybridized at carbon atom numbers four and five in 5b? **sp**
7. (7 pts.) a) Draw a Newman projection of the most stable conformation looking down the C2 –C3 bond of this molecule, 2-methylbutane. Use either enantiomer.

8. (10 pts.) b) Draw a Newman projection of the most stable conformation looking down the N-C bond of this molecule.

9. (6 pts.) How many stereoisomers (enantiomers and diastereomers), are there of this molecule. Note the possible symmetry of the stereoisomers is a function of the absolute configurations. You should probably save this problem for last. Work on back of this paper. Put your answer below.

\[ \#_{\text{stereo isomers}} = 2^6 \times 2^3 / 2 = 60 \]
9.) 

Maximum possible # of stereoisomers is \( 2^6 = 64 \) 

\[ 2 \cdot 2 \cdot 2 \cdot 2 \cdot 2 \cdot 2 \]

\[ \frac{1}{4} \cdot \frac{1}{8} \cdot \frac{1}{16} \cdot \frac{1}{32} \cdot \frac{1}{64} = 2 \]

Some of these are identical due to possible mirror plane half of the molecule is symmetry related.

\[ 2^3 = 8 \] possible stereo possibilities from pairs of identical structures