General Instructions:

(i) Use scratch paper at back of exam to work out answers; final answers must be recorded at the proper place on the exam itself for credit. Models are allowed.

(ii) Print your name on each page.

(iii) Please keep your paper covered and your eyes on your own work. Misconduct will lead to failure in the course.

1. (10 points) Provide IUPAC names for the following structures.

(a) \[ \text{Br} \]
\[ \text{H}_3\text{C}-\text{CH}_2-\text{CH}-\text{CH}-\text{CH}_3 \]
\[ \text{H}_2\text{C}-\text{CH}_2-\text{CH}_3 \]

(b) 

\[
\begin{array}{c}
\text{CH}_2-\text{CH}_3 \\
\text{CH}_2-\text{CH}_2-\text{CH}_3 \\
\end{array}
\]
2. (10 points) Shown below is the equation for a reaction, and the beginning of a mechanism. Complete the mechanism by drawing in the curved arrows that indicate the flow of electrons for each step.

Overall reaction: \((\text{CH}_3)_2\text{CBr} + \text{NaCl} \rightarrow (\text{CH}_3)_2\text{CCl} + \text{NaBr}\)

Mechanism:

3. (10 points) Give structures that correspond to the following names. Indicate all atoms in your structures explicitly, including hydrogens.

(a) 2-cyclobutyl-3-methylpentane

(b) 1,1-dibromo-3-ethylhexane
4. (21 points) For each molecule below, provide a drawing that unambiguously shows the most stable conformation.

(a) CH₃-CH₂-CH₂-Br

(b) 

(c)
5. (27 points) For each pair of isomers below, circle the one expected to have the greater internal strain. Briefly explain your reasoning, using conformationally informative drawings to illustrate your arguments.

(a) \[
\begin{align*}
\text{H}_2\text{C} & \text{CH}_3 \\
\text{CH}_3 & \text{CH}_3 \\
\text{CH}_3 & \text{CH}_3 \\
\end{align*}
\]
vs.

(b) \[
\begin{align*}
\text{CH}_3 & \text{CH}_3 \\
\text{CH}_3 & \text{CH}_3 \\
\end{align*}
\]
vs.

(c) \[
\begin{align*}
\text{H}_2\text{C} & \text{CH}_2\text{CH}_3 \\
\text{CH}_3 & \text{CH}_3 \\
\end{align*}
\]
vs.
6. (22 points)
(a) What is the molecular formula of cyclohexane?
(b) What is the molecular formula of n-hexane?
(c) Draw 10 isomers of cyclohexane.