REVIEW PROBLEMS

The problems below are a review of some of the important concepts that you covered last semester. They will not be graded, and you will not be held responsible for this material per se, but an understanding of the material covered in CHE275 will, no doubt, be beneficial to your continuing study of organic chemistry. You will definitely come across these topics again. As such, in addition to working these problems, consider the following suggestions:

- Just to refresh your memory, it is a good idea to review the reactions that you covered last semester. As you get more practice at "synthesizing" simple compounds, you may find some of these reactions helpful. For quick and easy reference, look over the following summary pages in Solomons & Fryhle:
  - Ch 6: Reactions of Alkyl Halides  pgs 260-262
  - Ch 7: Alkenes & Alkynes I: Elimination Reactions pgs 303-306
  - Ch 8: Alkenes & Alkynes II: Addition Reactions pgs 347-350; 354-355

- Don’t forget about conformation and stereochemistry! These concepts will continue to be important throughout the coming semester.

- Don’t forget about Infrared and 1H NMR Spectroscopy (Chapters 2 & 9). We will continue to study and use these analytical methods this semester.

Several of the problems below relate to material we covered more recently in chapter 9.

1. Draw a complete orbital picture for the molecule shown below. Is this molecule chiral? Explain.

![Molecule](image)

2. For each of the following compounds, draw the important resonance structures.

![Resonance Structures](image)

3. Indicate the direction of polarity for each of the bonds indicated:

![Polarity Indications](image)
4. Give IUPAC names for each of the following compounds:

![Chemical structures](image1)

5. Identify the functional groups in the following molecules.

![Chemical structures](image2)

6. Using Newman projections, show all possible conformations of 1-bromobutane. Identify the lowest and highest energy conformations.

7. Draw the two possible chair conformations of the following molecules. In each case, identify the lowest energy conformation, and explain your reasoning.

![Chemical structures](image3)

8. Define the following terms, and give an example of each:
   a. nucleophile
   b. electrophile

9. Show all possible stereoisomers of the following compound. Note that there are 3 stereogenic centers. Identify the relationship of each of these isomers with one another, e.g. enantiomers, diastereomers, etc.

![Chemical structure](image4)
10. Assign the absolute configuration of each stereogenic center present in the molecule shown below.

```
CH₃ OH
OCH₃
```

11. Write a complete mechanism to explain the following observation:

```
CH₃
/ 
CH₂=CH₂ \ HCl \-> CH₃CH₂Cl + CH₃CH=CHCH₃
```

major product        minor product

12. Predict all products from the following reactions. Label major and minor products.

```
\[
\text{Cl} \quad \text{Br} \\
\text{CH} - \text{CH} \quad \text{KOH} \\
\text{ethanol (1 equiv.)} \\
\]
```

```
\[
\text{A} + \text{B} \\
\text{NaNH}_2 \quad \text{NH}_3 \\
\text{C} \quad \text{NaNH}_2 \\
\text{CH}_3\text{CH}_2\text{Br} \quad \text{H}_2 \quad \text{Lindlar Pd} \\
\text{F} \quad \text{G} \\
\]
```

13. For each of the following transformations (A - D), the major product is shown. In each case, explain why the product formed is the major one. It may help to consider what minor products may be formed.

```
\[
\text{CH}_3 \quad \text{CH}_3 \\
\text{CH}_3 \quad \text{H}_2\text{SO}_4 \\
\text{A} \quad \text{B} \\
\text{H}_3\text{O}^+ \quad \text{heat} \\
\text{C} \quad \text{CH}_3 \quad \text{Br}_2 \\
\text{D} \quad \text{KOH} \\
\text{ethanol} \\
\]
```
14. An unknown compound had the following MS:

a) identify the base peak and the parent ion in this spectrum

b) what is the formula weight of this compound?
15. Match a structure from the list below to the following IR spectra. Clearly identify and label diagnostic absorbances in each IR.

a. Compound: 

b. Compound: