Elimination Reactions

**Pre-lab reading** from Mohrig, “Techniques in Organic Chemistry”
- Technique 19 (Gas chromatography)

**Procedure:** You will work with a partner to accomplish the following two elimination reactions.

*Elimination of 2-methyl-2-butanol under acidic conditions*  Place 2.4 grams of 2-methyl-2-butanol in a 25 mL roundbottom flask with a stirbar. Carefully add 15 mL of 6 M sulfuric acid to the flask. Add an air condenser to the flask and complete the fractional distillation apparatus shown in Figure 13.17 (except the air condenser will replace the fractionation column.) Place the receiving flask in an ice water bath.

Gently heat the reaction in a water bath at 85-90 °C. Collect the distillate that comes over below 45 °C. Make a GC sample as directed by your AI. Analyze the product by GC.

*Elimination of 2-chloro-2-methylbutane under basic conditions*  Put 23 mL of basic 1-propanol solution in a 50 mL roundbottom flask. (There are 3.0 g of KOH per 23 mL of the solution.) Slowly pour 3.0 mL of 2-chloro-2-methylbutane (from last week) into the basic solution. (If you don’t have 3 mL, get some 2-chloro-2-methylbutane from your partner.) Assemble a fractional distillation apparatus with a jacketed condenser as the fractionation column. Use a tared, 25 mL roundbottom flask in ice as a collecting flask. Heat and stir the reaction for one hour in a 75-80 °C water bath, monitoring the temperature closely so that it does not exceed 80 °C during the reflux period. Add additional ice to the receiving flask as necessary. A white precipitate will form in the reaction flask.

After one hour, increase the water bath temperature to 90-95 °C and distill the reaction mixture. Collect all the distillate boiling below 45 °C. Make a GC sample as directed by your AI. Analyze the product by GC.

**Notebook Guideline**

Record a main reaction data table and any observations and results that are appropriate.

Attach the GC trace, and make a table that includes retention time and integration.

**Discussion:**
1. Provide a full mechanism for the acid catalyzed dehydration of 2-methyl-2-butanol to form both alkene products

2. Provide a full mechanism for the base catalyzed dehydrochlorination of 2-chloro-2-methylbutane to form both alkene products.
3. Which product formed preferentially in the acid catalyzed reaction? Use data to quantify this product distribution. Does product stability or statistical factors determine the product distribution? Justify your answer using your data and referring to the mechanism.

4. Which product formed preferentially in the base catalyzed reaction? Use data to quantify this product distribution. Does product stability or steric factors determine the product distribution? Justify your answer using your data and referring to your mechanism.