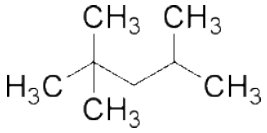
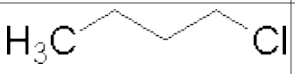
Experiment 6: Scientific Method: Radical Chlorination of Alkanes

Tuesday, April 03, 2007
7:30 PM

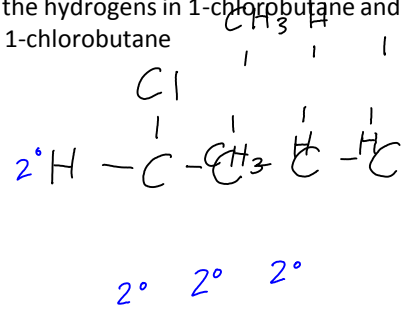
Title: Experiment 6: Scientific Method: Radical Chlorination of Alkanes

Purpose:

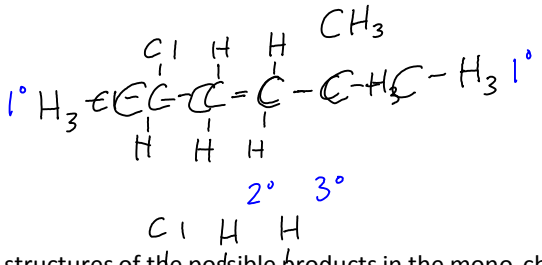
Pre-lab:

Compound Name	Structure	Hazards
2,2,4-trimethylpentane		Flammable, Harmful, Dangerous to environment
1-chlorobutane		Flammable
hypochlorite	OCl^-	Corrosive
Hydrochloric acid	H-CL	Irritant
Chlorine	Cl-Cl	Toxic, Dangerous to environment

1. Label the hydrogens in 1-chlorobutane and 2,2,4-trimethylpentane as 1°, 2°, or 3°.
   a. 1-chlorobutane

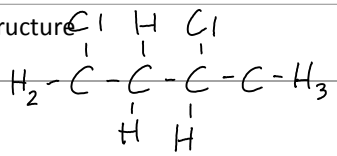
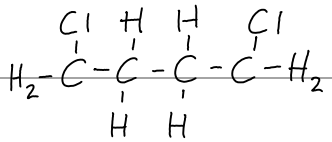
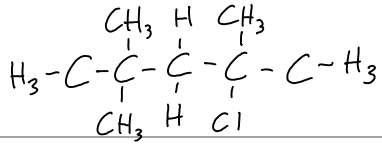
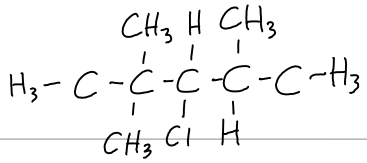


   b. 2,2,4-trimethylpentane

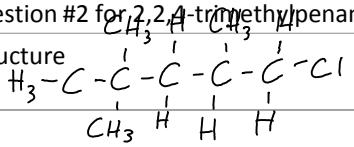
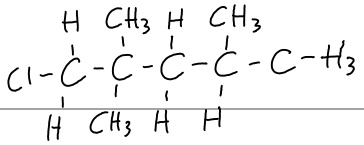


2. Draw the structures of the possible products in the mono-chlorination of 1-chlorobutane. Using only statistical

factors, predict the proportions of isomeric products that would be formed in the monochlorination of 1-chlorobutane.

1°,2°, or 3°	Structure	Proportions
2°		# of 2° hydrogens: 6 # of 1° hydrogens: 3
2°		
2°		
1°		

3. Repeat pre-lab question #2 for 2,2,4-trimethylpenane.

1°, 2°, or 3°	Structure	Proportions
3°		# of 3° hydrogens: 1 # of 2° hydrogens: 2 # of 1° hydrogens: 6
2°		
1°		
1°		

Procedure:

1. Label 2 reaction tubes
2. 1.0 mL 1-chlorobutane into 1 tube
3. Add 1.0mL commercial bleach (5-7% sodium hypochlorite)

4. Add 1.0mL of 3.0M HCL
5. Cap tube quickly
6. Shake tube under hood for 30 seconds until greenish yellow color has moved to organic phase.
7. Repeat using other tube and 2,2,4-trimethylpentane
8. Clamp both tubes approx 5-10cm from unfrosted light bulb
9. Occasionally shake for 2 minutes or when chlorine disappears from organic layer
10. Add 100mg portions of anhydrous sodium carbonate to each tube (until foaming stops from HCL reacting)
11. Draw into Pasteur pipet and expel several times.
12. Add approx 100mg calcium chloride (drying agent) to upper (organic) phase
13. Swirl organic phase and let set for 10 min
14. Filter pipet solid drying agent
15. Transfer liquid organic products into glass vial. Label and seal with cork (not rubber stopper)
16. Perform GC/Mass spectrometry