

## Important Concepts for First Examination

### I. Laboratory Experiments

- A. Melting Point Determination
- B. Recrystallization—two ways this purifies a compound
- C. Distillation

### II. Introductory Material

- A. Lewis (electron-dot) structures
- B. Molecular shapes; hybridization; bond angles
- C. Polarity
- D. Resonance
- E. Types of **hydrocarbons**—alkanes, alkenes, alkynes, aromatics
- F. Functional groups—the 12 (or so) types
- G. Units of unsaturation (be able to determine)

### III. Alkanes

- A. Nomenclature
  1. Systematic (IUPAC) naming
  2. Common names for small branched alkyl groups (isopropyl, isobutyl, *etc.* from handout)
  3. Cycloalkanes
- B. Drawing structures
  1. Structural formulas; condensed formulas; “line” or “stick” formulas
  2. Newman projections; sawhorse projections
  3. Conformational analysis (*e. g.*, C2-C3 bond of butane)—structures and relative energies of **conformers** (AKA conformational isomers): eclipsed vs. staggered
- C. Cyclic alkanes
  1. Isomers
    - a) “dashed-wedged line” formulas
    - b) *cis* vs. *trans* **geometric isomers**
    - c) **Conformational isomers** (conformers) of cyclohexane: chair, boat, *etc.*; axial vs. equatorial substituents
  2. Stability of substituted cyclohexanes in chair conformation: axial vs. equatorial

### IV. Alkenes/Alkynes/Other functional groups

- A. Nomenclature, drawing structures

### V. Isomerism: **structural/constitutional** (same molecular formula), **geometric** (*cis* vs. *trans*), **conformational**, **enantiomers**, **diastereomers** (also **identical**, **not isomers**)

- A. *cis* vs. *trans* and E/Z **geometric isomers** of alkenes
- B. Optical Isomers
  1. # of optical isomers =  $2^n$  ( $n$  = # chiral carbons)
  2. properties of enantiomers/diastereomers (optical rotation, bp, mp, *etc.*)
  3. assigning absolute configuration (R/S)
  4. Fischer projections
  5. enantiomers/diastereomers/meso compounds

### VI. Recommended **reading** (see syllabus), **WORKSHEETS**, and **homework problems**.