I. 

One more NMR example - See Handout of Powerpoint

- ACH₂

4 neighbors - 3 different kinds of protons

- measure heights of integration peaks to determine the relative number of protons for each peak

- benzene (aromatic) rings show up around 7-8 ppm

- benzene rings take care of 4 units of unsaturation
  - has 3 double bonds + 1 ring
  - have a multiplet with 17 peaks for the single 1H proton with 6 neighbors
    - height ratios of 1:4:6 so as in a 1, 4, 6 triangle

- Benzene hydrogens:

II. Chapter 2 - Hydrocarbons

A. Saturated vs Unsaturated

- no C=C double bonds
- C-C double bonds

B. Know how to draw structures if given the name and the compound = Nomenclature
1. **Hydrocarbons** = just C and H \( \rightarrow \) no other functional groups

- Saturated: \( \text{C} - \text{C} \) or \( \text{C} - \text{H} \) no \( \text{C} = \text{C} \)

  * Can add H to \( \text{C} = \text{C} \) to make an unsaturated hydrocarbon.

  \[
  \text{C} = \text{C} \quad \xrightarrow{H} \quad \text{C} - \text{C} - \text{C} \quad \text{C} - \text{C} - \text{H}
  \]

- Unsaturated: double and triple bonds

  \[
  \text{C} = \text{C} - \text{C} = \text{C}
  \]

- **Fats:** Saturated and unsaturated

  - \( \text{CH}_3(\text{CH}_2)_n\text{COOH} \) Saturated

  - \( \text{CH}_3(\text{CH}_2)_n\text{CH}=\text{CH}_2\text{COOH} \) Unsaturated

2. **Specific hydrocarbons**

- **Methane** \( \text{CH}_4 \) \( \text{b.p.} = -161^\circ \text{C} \)

- **Ethane** \( \text{CH}_3\text{CH}_3 \)

- **Propane** \( \text{CH}_3\text{CH}_2\text{CH}_3 \)

- **Butane** \( \text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_3 \)

  * Can have isomers: linear or branched

- **Pentane** \( \text{CH}_3(\text{CH}_2)_3\text{CH}_3 \) \( \text{b.p.} = 36^\circ \text{C} \) = liquid at room temp.

* **Names follow geometric structures:** hexane, heptane, octane, nonane, decane

*Know the first 10 hydrocarbons*

- **Alkanes** = compound that only has C and H \( \text{single bonds} \)

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3. Water and hydrocarbons do not mix:

- Have different polarities
- e.g. CH₄

- Water \( (18 \text{ g/mol}) \) interacts via hydrogen bonds → strong intermolecular interactions due to Van der Waals interactions → causes b.p. to increase
- Water \( (18 \text{ g/mol}) \) is more dense than alkanes → e.g., hexane \( (0.68 \text{ g/mL}) \)

- Octane has b.p. = 125°C
- Gasoline - mixture of hydrocarbons: \( C_2 - C_{12} \)
- Diesel fuel: \( C_{12} - C_{15} \)
- Gasoline: \( C_{20} - C_{24} \)
- Wax: \( C_{25} - C_{30} \)
- \( -(C)_{100,000} \) - polyethylene = very long hydrocarbons 
  e.g. from long chains

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4. Shapes of Hydrocarbons:

- Shaken Configuration (SD)

- Newmann Projection: Look down C-C bond

- Butane Newmann Projections:

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Notes Taken By  Lauren Buck  Total Number of Pages  5

- Bureau is mostly in the staggered conformation

- Larger chains of hydrocarbons line up in zig-zag:

- Can you make a molecule go into an eclipsed conformation?
  * Put it into a ring:

- Cyclobutane and cyclopentane are similar - eclipsed H atoms

- Cyclohexane can form a staggered conformation - make the protons staggered

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