Today’s Objectives:

1) Name and draw structural, condensed structural, and line diagrams and formulas for aromatic carbon compounds
   • Using the IUPAC nomenclature guidelines

2) Identify types of compounds from the functional groups, given the structural formula

3) Define structural isomerism and relate to variations in properties
Aromatics

- Originally, organic compounds with an aroma or odour were called *aromatic compounds*.
- Now, aromatics refer to compounds containing a benzene-ring structure.
  - Benzene’s formula is C$_6$H$_6$, which would suggest a highly unsaturated and reactive compound.
  - Benzene is actually quite *unreactive* and is considered more stable than alkenes and alkynes.
  - *Did You Know??* Benzene is a carcinogen and is found naturally in petroleum – why would this be a problem?
What do we know about benzene?

- Formula is $C_6H_6$ (3D link)
- Unreactive — so no true double or triple bonds
- Carbon-carbon bonds are the same length and strength
- Each carbon is bonded to a hydrogen
- So what does benzene look like??

The three double bonds resonate resulting in an overall bond length somewhere in between a single and a double bond, explaining benzene’s stability.
Common Aromatic Compounds

- Include Aspirin and Vanillin (one of the flavour molecules in vanilla)
  - You will notice many aromatic molecules are often depicted using a condensed structural formula except for the benzene ring, which is shown as a line structural formula.
  - This combination is commonly used by chemists, and we will use this method when drawing aromatics.

![Aspirin](image1.png)
![Vanillin](image2.png)
1. If an alkyl branch is attached to a benzene ring, the compound is named as an **alkylbenzene**.

   Alternatively, the benzene ring may be considered as a branch of a large molecule: in this case, the benzene ring is called a **phenyl** branch. **Which has a phenyl branch?**

An alkylbenzene

Contains a phenyl branch
If more than one alkyl branch is attached to a benzene ring, the branches are numbered using the lowest numbers possible, starting with one of the branches.

Given the choice between two sets of lowest numbers, choose the set that is in both numerical and alphabetical order.

1-ethyl-2,4-dimethylbenzene

3-phenyl-4-propyloctane
Draw 1,2-dimethylbenzene

Are there any isomers of this compound?

There is also *classical* way of naming these isomers. The arrangements are denoted by the prefixes: ortho (o), meta (m) and para (p). These names are still used in industry so you may encounter them in other references.
Practice Naming Aromatics

- Draw the line structural formula for 1-ethyl-3-methylbenzene
- Draw the line structural formula for 2-phenylpentane
Practice Naming Aromatics

- Draw 3-phenylpent-2-ene

\[
\begin{align*}
\text{CH}_3 & - \text{CH}_2 - \text{CH} = \text{CH}_2 - \text{CH}_3 \\
\text{3-phenylpentane}
\end{align*}
\]

- Name the following propylbenzene

\[
\begin{align*}
\text{CH}_2 - \text{CH}_2 - \text{CH}_3
\end{align*}
\]

Why is no number needed?

Are the hydrogen’s wrong??
We have now learned about both aliphatic and aromatic hydrocarbons. You will need to be comfortable naming all of the following:

- Alkanes
- Alkenes
- Alkynes

*Includes cyclo compounds of each family
Review of Intermolecular Forces

- **London Forces** – temporary dipoles resulting from an uneven distribution of e\(^-\) in all molecules
  - Temporary (-) end will repel e\(^-\) in neighbouring molecules and so on
  - Depends on size of molecule (number of e\(^-\)’s)
  - Weakest of the intermolecular forces

- **Dipole-Dipole** – only exists in polar molecules
  - Attraction between + and – ends of molecule

- **Hydrogen Bonding** – super strong force
  - Only exists when H-N, H-F, H-O bonds are present
Today’s homework

- Pg. 385 #3-5 – due tomorrow

- What is coming up tomorrow?
  - Hydrocarbons Quiz
  - Review Aromatic and Aliphatic Compounds