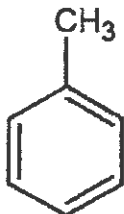
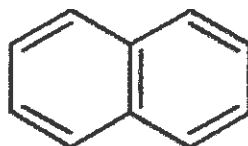


## 4.0 Aromatic Hydrocarbons

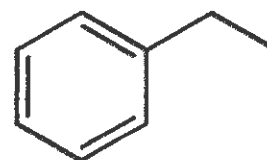
Aromatic hydrocarbons, named for their pleasant smells, are unsaturated hydrocarbons that have a ring structure and a bonding arrangement that causes it to be chemically stable.



**toluene**  
solvent used glues,  
paints, nail polish  
remover



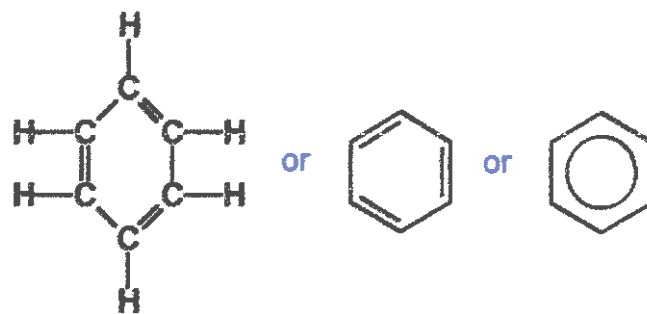
**naphthalene**  
common pesticide or to  
make plastics, resins, and  
fuels



**ethylbenzene**  
precursor to styrene (food  
containers)

### Benzene, C<sub>6</sub>H<sub>6</sub>

- the simplest aromatic hydrocarbon
- structural diagram shows three double bonds alternating with single bonds
  - but measurements have shown all bond lengths to be equal!
  - hence the hexagon with a circle inside to show that the electrons in the bonds are shared equally between all six C atoms.



Molecular Formula for benzene is C<sub>6</sub>H<sub>6</sub>

- colorless, flammable liquid with a sweet odor
- evaporates quickly when exposed to air
- found naturally in crude oil and gasoline
- also formed during natural processes, such as volcanoes and forest fires

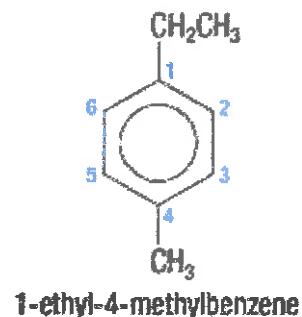
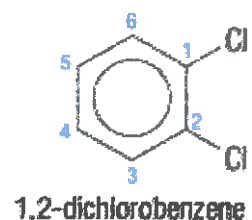


- used mainly as a starting material in making other chemicals, such as plastics, resins, synthetic fibers, dyes, detergents, drugs, and pesticides
- known carcinogen
- in the past, it was used as an industrial solvent and as a gasoline additive, but these uses have been greatly reduced in recent decades

## Naming Aromatic Hydrocarbons

### 1. Aromatic Hydrocarbons with non-carbon substituents or a small alkyl group

- benzene ring is the parent molecule and attached groups are the branches
- if only one functional group is attached, numbering is not needed
  - e.g. if a methyl group is attached, the molecule is called methylbenzene
  - e.g. if chlorine replaces a H atom, the molecule is called chlorobenzene
- when we have 2 or more alkyl groups attached, number the carbon atoms starting with the first substituent (alphabetically) and continue numbering in the direction of the next closest substituent

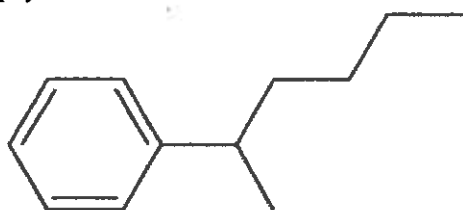


### 2. Aromatic Hydrocarbons are the substituents to a hydrocarbon chain

- a benzene ring that has lost one H atom is called a phenyl group

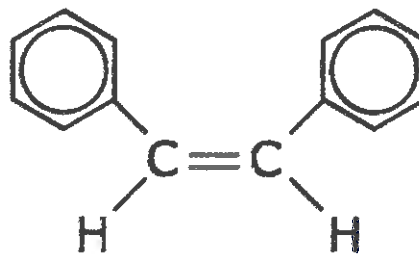
Examples:

(a)



2-phenylhexane

(b)

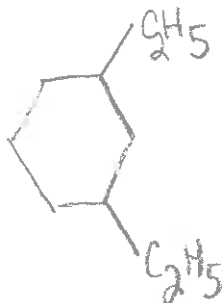


1,2-diphenyl-1-ethene

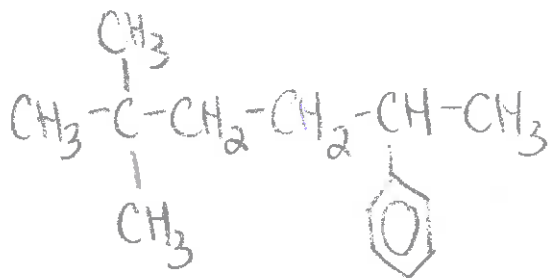
## Drawing Aromatic Hydrocarbons

Examples:

(a) 1,3-diethylbenzene



(b) 2,2-dimethyl 5-phenylhexane



## Properties of Aromatic Hydrocarbons

Symmetrical structure causes most to be non-polar molecules, unless they have an electronegative substituent group. Due to non-polar nature, most are insoluble in water.

Because of the unique bonding of benzene, aromatic hydrocarbons are much less reactive than alkenes.