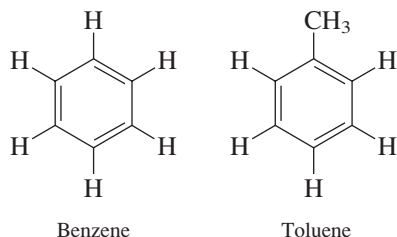


## CHAPTER 6

### AROMATIC COMPOUNDS

This chapter introduces the structure and key reactions of aromatic compounds. A good place to begin is with **aromatic hydrocarbons**, also called **arenes**. Benzene and toluene are the two simplest arenes.



Although historically the word “aromatic” referred to the origin of many of these compounds in pleasant-smelling plant materials (see the following essay *Aromatic Compounds: History and Some Applications*), today the term has a very different meaning, as you will see when the structure and stability of benzene are discussed.

Aromatic compounds have chemical properties very different from those of unsaturated aliphatic compounds such as alkenes and alkynes. Many of the substances that add to the double bond of alkenes undergo a reaction called **electrophilic aromatic substitution** with aromatic compounds. This reaction is one of the featured topics of the present chapter.

#### 6.1 STRUCTURE AND BONDING OF BENZENE

One of the earliest structural formulas for benzene was proposed by August Kekulé in 1866. Kekulé suggested a structure having alternating single and double bonds in a ring of six carbons, each carbon having one hydrogen attached.

#### CHAPTER OUTLINE

##### 6.1 Structure and Bonding of Benzene

Aromatic Compounds: History and Some Applications

##### 6.2 An Orbital Hybridization View of Bonding in Benzene

##### 6.3 Substituted Derivatives of Benzene and Their Nomenclature

##### 6.4 Polycyclic Aromatic Hydrocarbons

Chemical Carcinogens

##### 6.5 Aromatic Side-Chain Reactions

##### 6.6 Reactions of Arenes: Electrophilic Aromatic Substitution

##### 6.7 Mechanism of Electrophilic Aromatic Substitution

##### 6.8 Intermediates in Electrophilic Aromatic Substitution

Nitration

Sulfonation

Halogenation

Friedel–Crafts Alkylation

Friedel–Crafts Acylation

##### 6.9 Rate and Regioselectivity in Electrophilic Aromatic Substitution

##### 6.10 Substituent Effects: Activating Groups

##### 6.11 Substituent Effects: Strongly Deactivating Groups

##### 6.12 Substituent Effects: Halogens

##### 6.13 Regioselective Synthesis of Disubstituted Aromatic Compounds

##### 6.14 A General View of Aromaticity: Hückel’s Rule

##### 6.15 Heterocyclic Aromatic Compounds

Learning Objectives

##### 6.16 Summary

Additional Problems