

# **Aromatic Hydrocarbons**

# **Benzene** $\text{C}_6\text{H}_6$

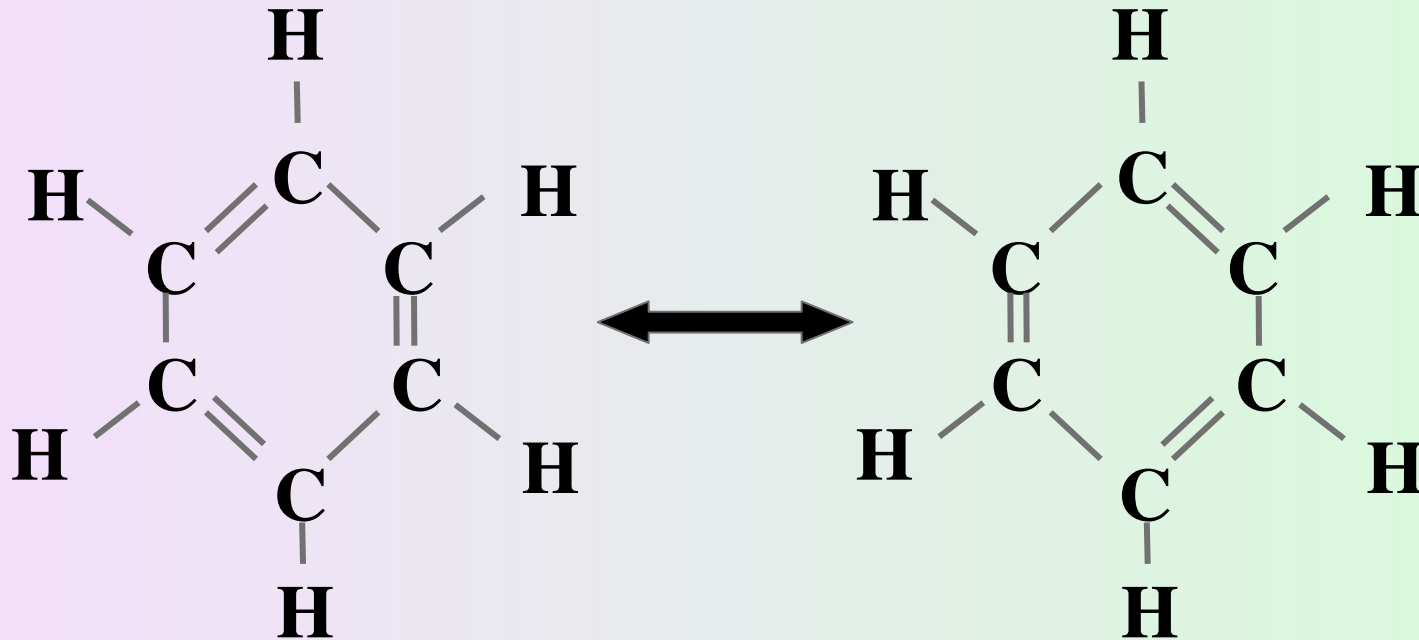
**due to benzene's high carbon to hydrogen ratio  
it was assumed that it would under go addition  
reactions similar to that of alkenes and alkynes**

**Benzene how ever proved to be relatively inert**

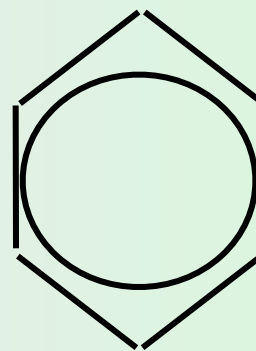
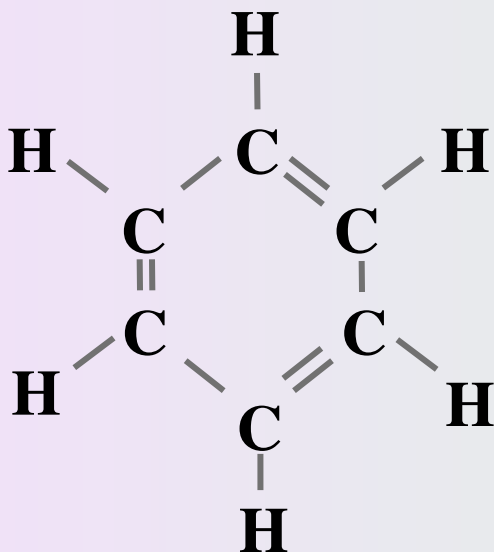
# August Kekule

deduced the structure of benzene to be planar and cyclic

the properties of benzene can be explained by delocalized molecular orbitals

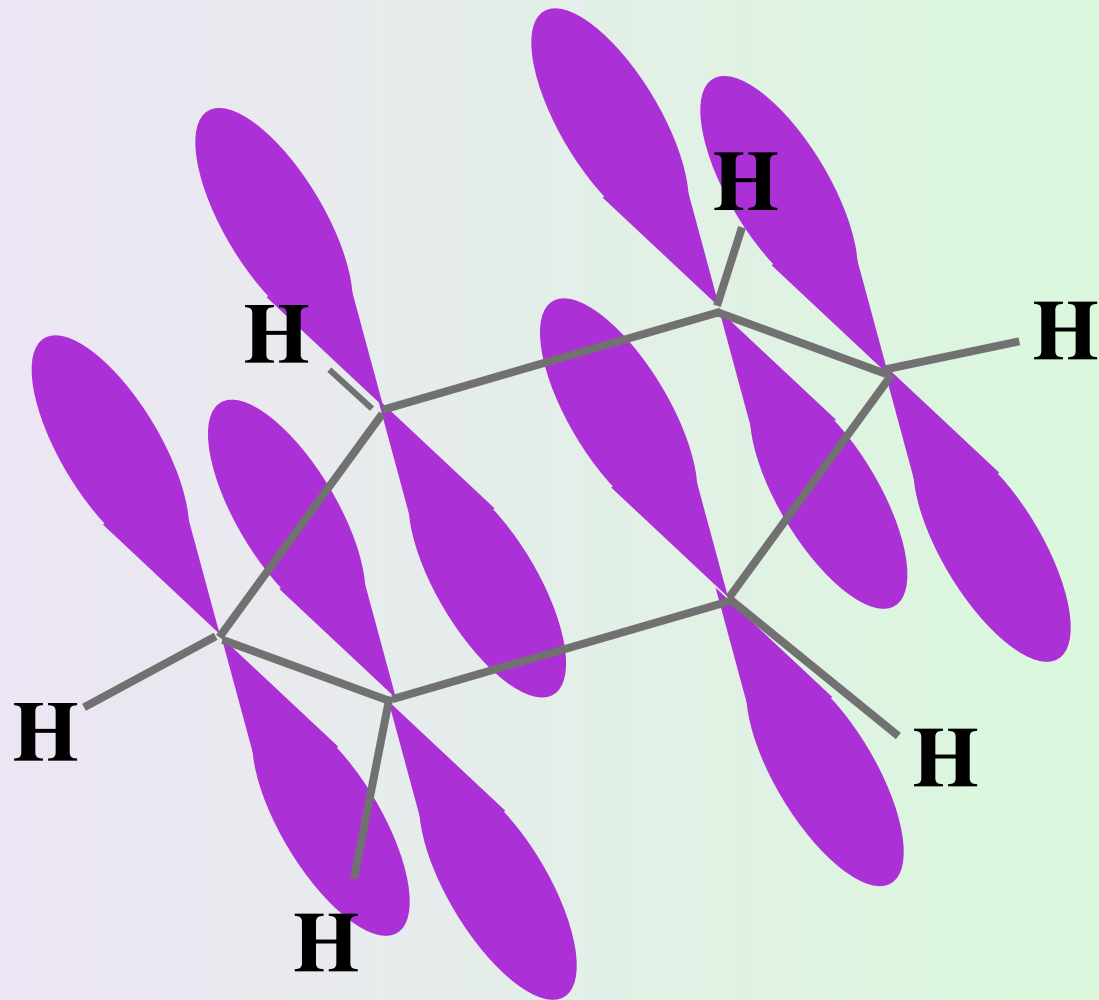


# Benzene $C_6H_6$



**The circle represents the electrons in the  $\pi$  system.**

# Benzene $C_6H_6$

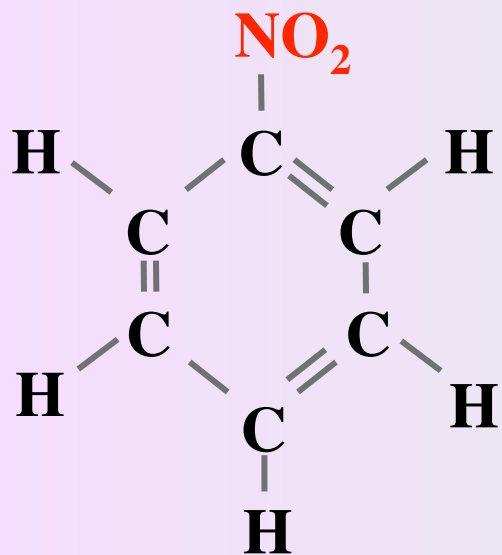


**Benzene**  $\text{C}_6\text{H}_6$

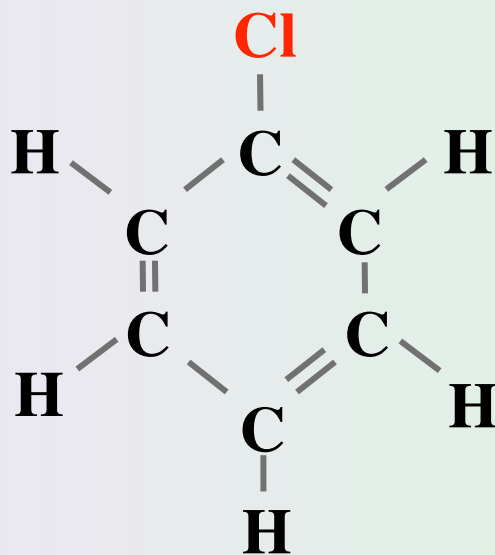


# Nomenclature

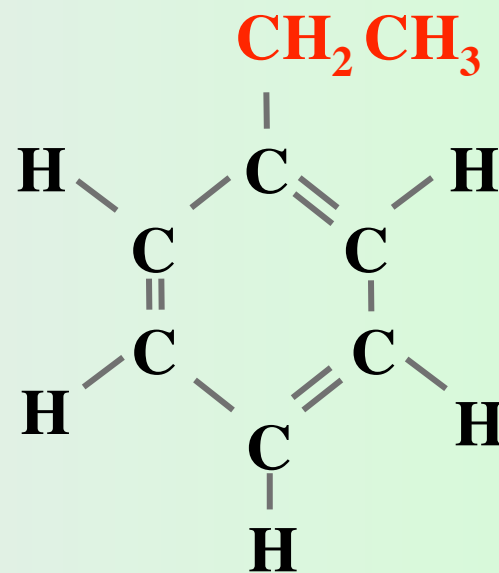
## Naming of monosubstituted benzene



**nitrobenzene**



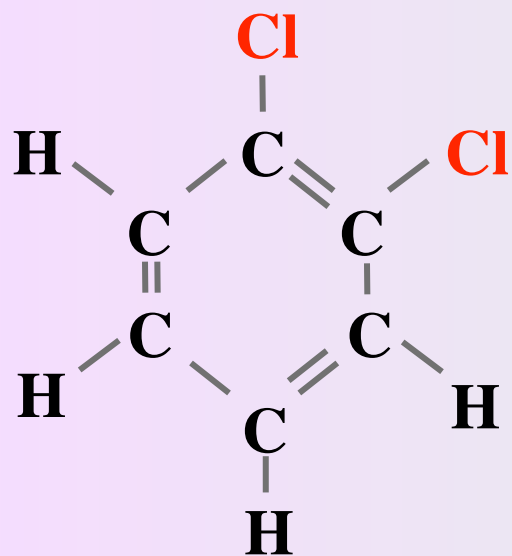
**chlorobenzene**



**ethylbenzene**

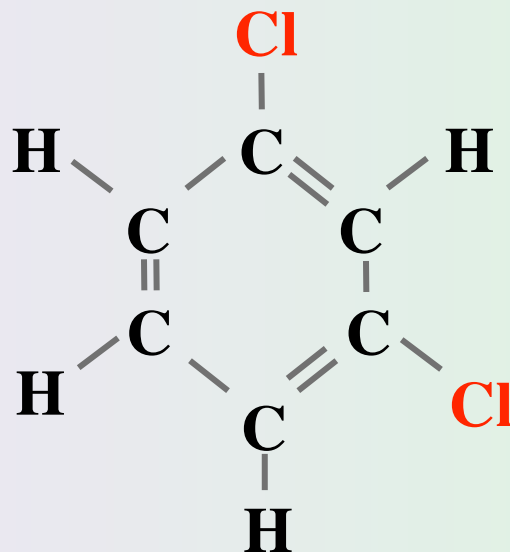
# Nomenclature

If more than one substituent is present we must indicate the location of the second group relative to the first



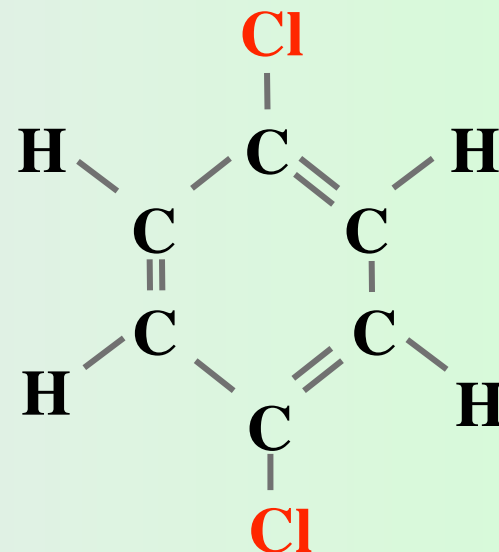
1,2-dichlorobenzene

*ortho*



1,3-dichlorobenzene

*meta*



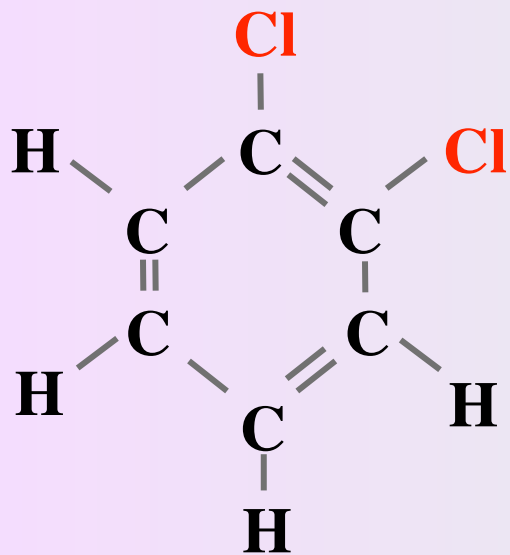
1,4-dichlorobenzene

*para*

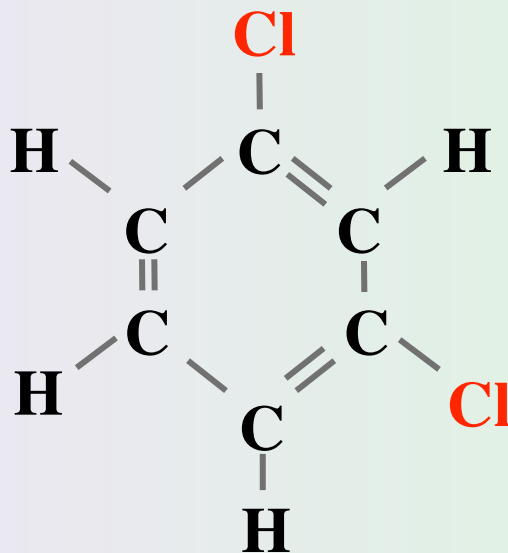


# Nomenclature

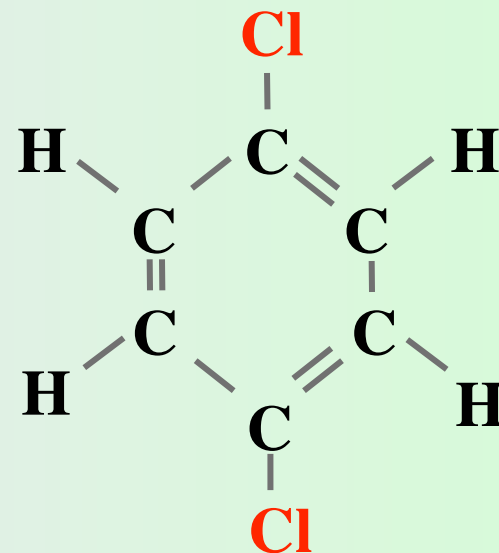
If more than one substituent is present we must indicate the location of the second group relative to the first



*o*-dichlorobenzene



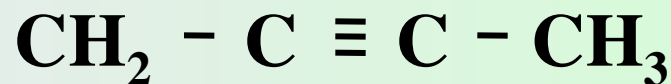
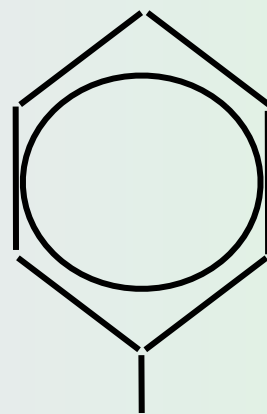
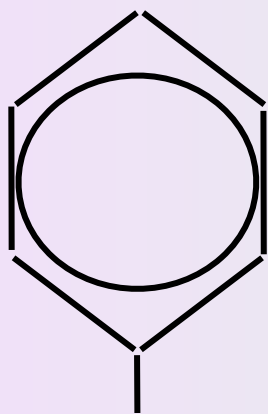
*m*-dichlorobenzene



*p*-dichlorobenzene

# Benzene $C_6H_6$

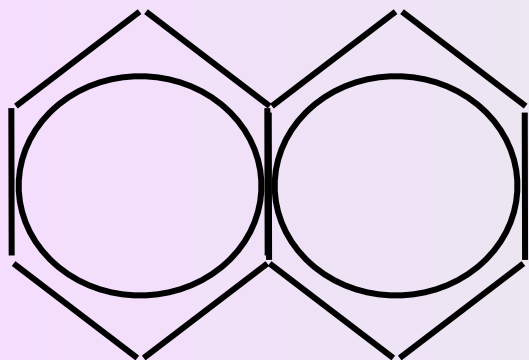
when benzene is used as a substituent, it is called the **phenyl Group**



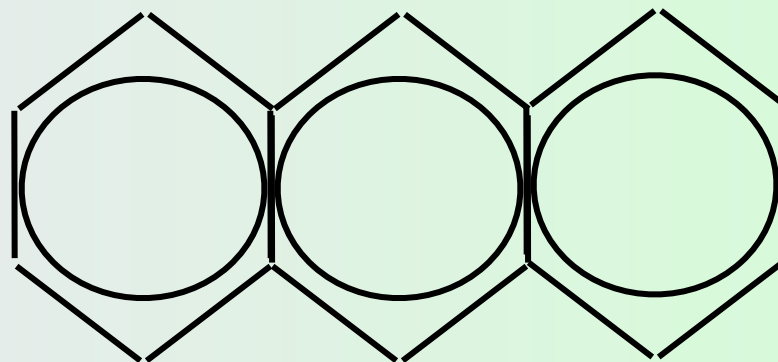
**1-phenyl-2-butyne**

# Nomenclature

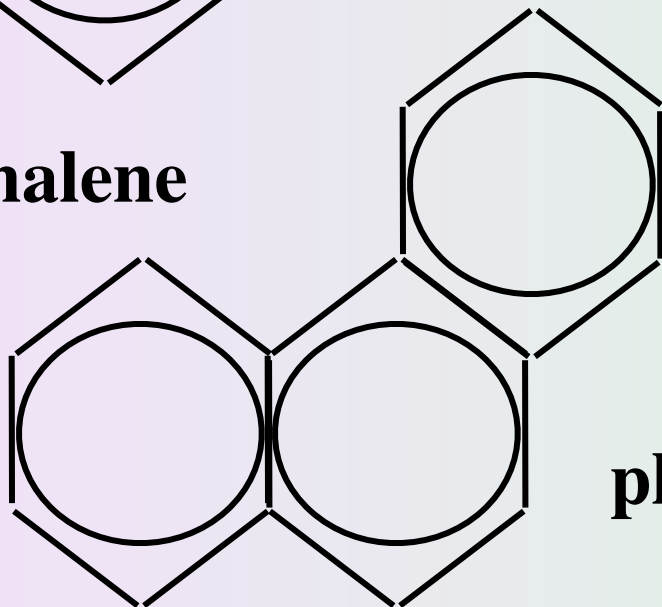
Any group that contains one or more fused benzene rings is called an **aryl group**



**Naphthalene**



**Anthracene**



**phenanthrene**

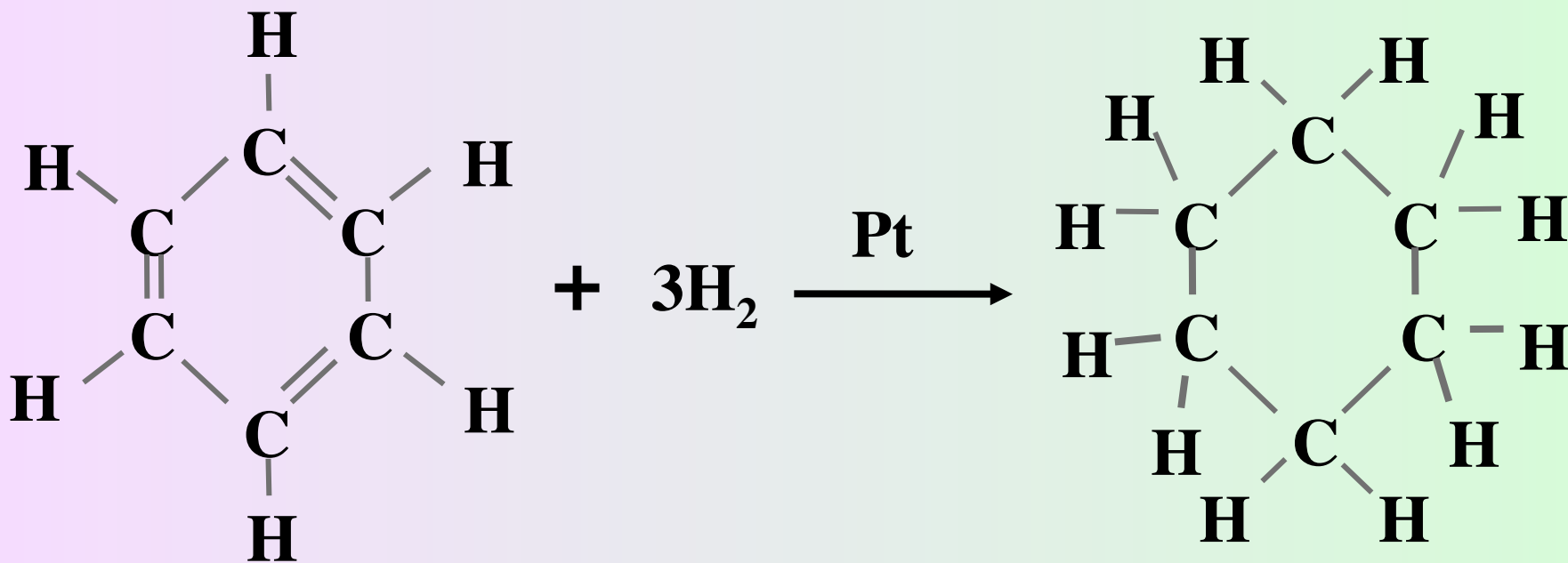
# **Chemical Reactions involving Aromatics**

**Addition reactions**

**hydrogenation**

# Chemical Reactions involving Aromatics

benzene can be hydrogenated with difficulty



# **Chemical Reactions involving Aromatics**

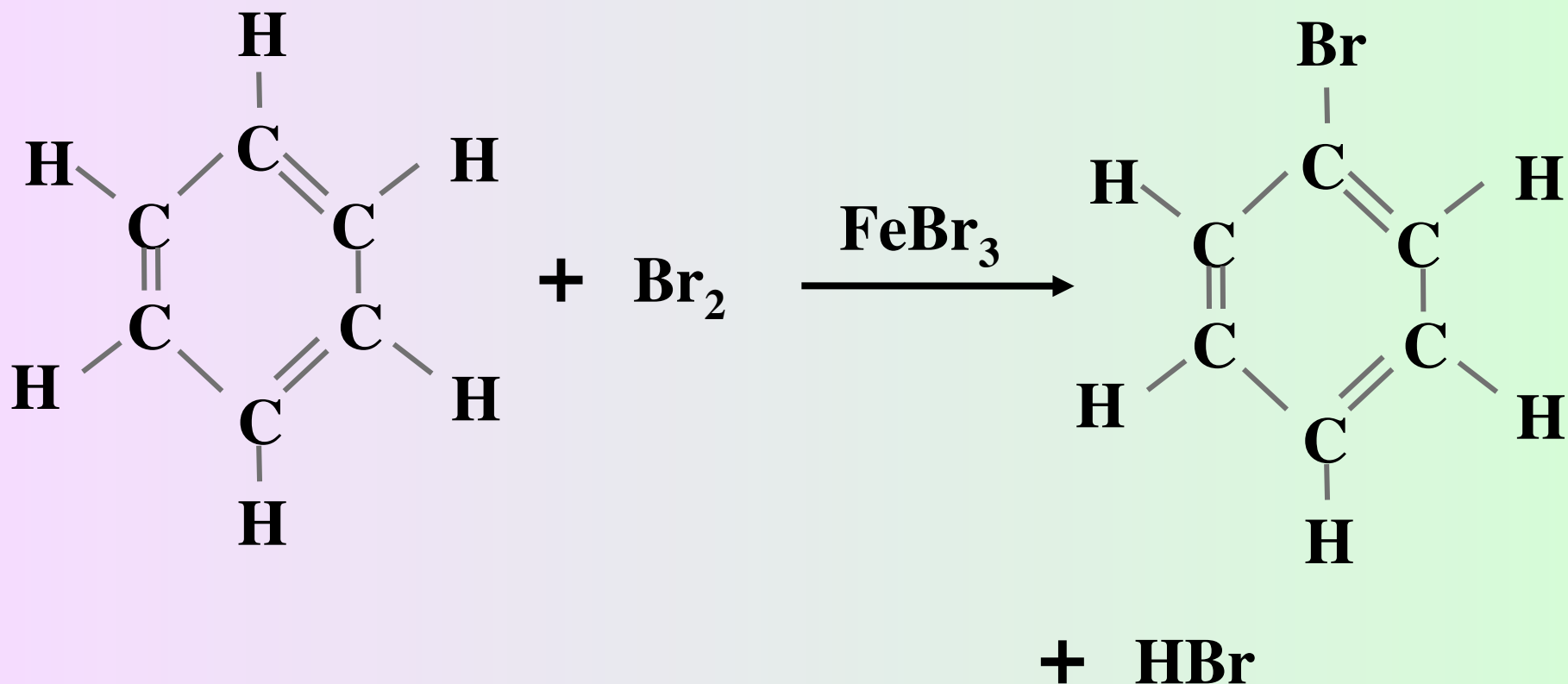
**substitution reactions**

**with hydrogen halides**

**alkyl groups**

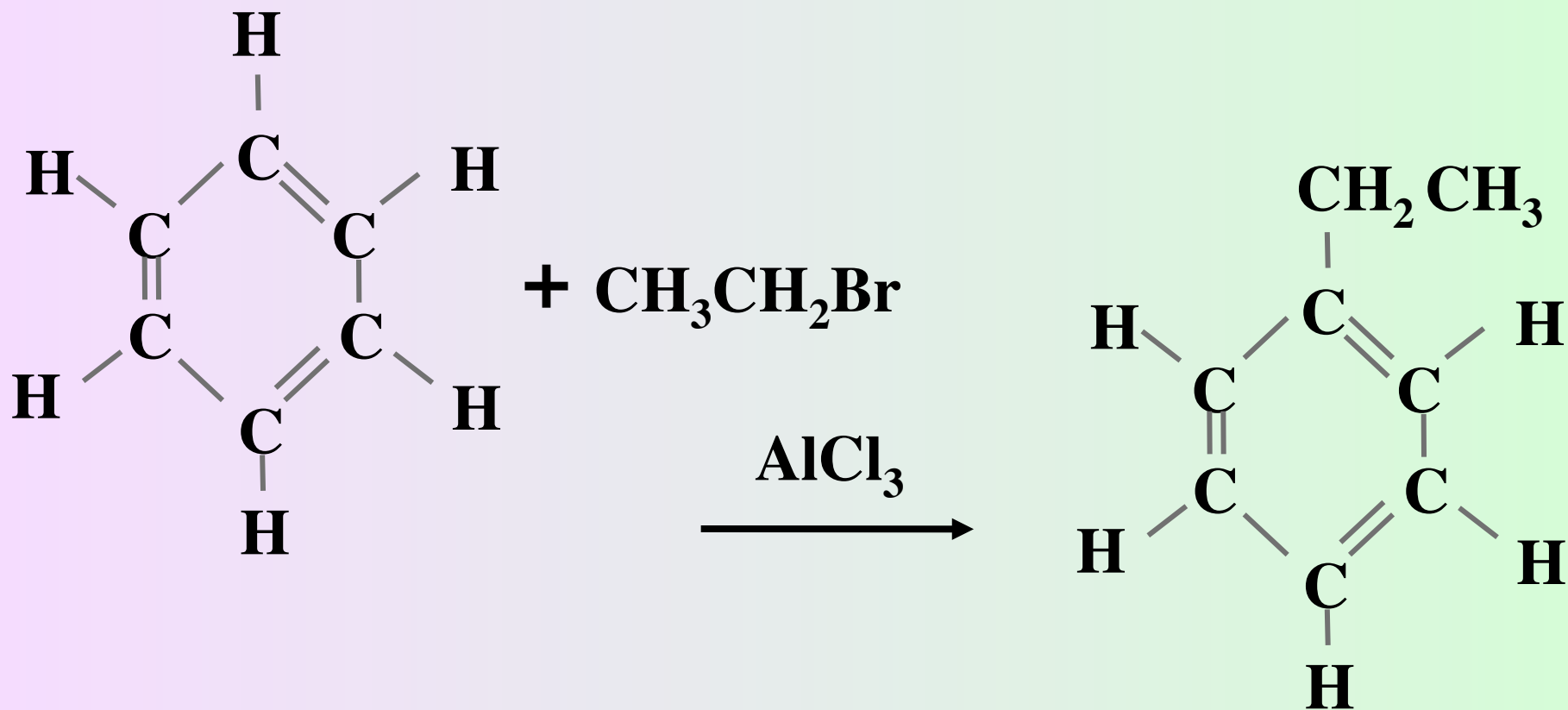
# Chemical Reactions involving Aromatics

substitution of benzene with halogens using  $\text{FeBr}_3$  as catalyst



# Chemical Reactions involving Aromatics

Alkyl groups can be introduced into the ring system by allowing benzene to react with an alkyl halide using  $\text{AlCl}_3$  as a catalyst

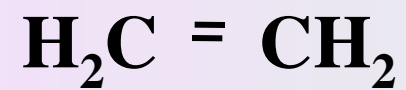




# Polymerization

**Building large molecules (polymers) from small molecules (monomers).**

**ethylene**



**polyethylene**

