CYCLIC AND HETEROCYCLIC AROMATIC COMPOUNDS

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Outline

1. Polycyclic aromatic hydrocarbons
2. Basicity and acidity of the nitrogen heterocycles
3. Chemistry of pyrrole, furan, and thiophene

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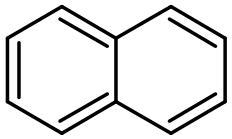
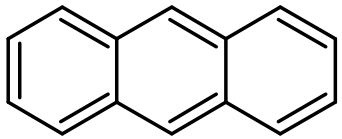
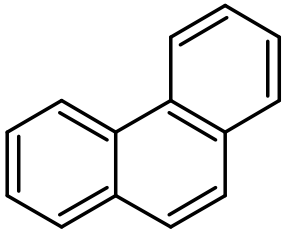


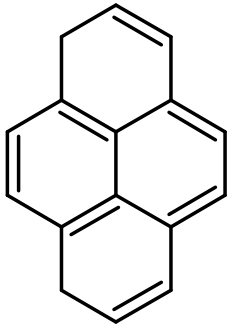
naphthalene



anthracene

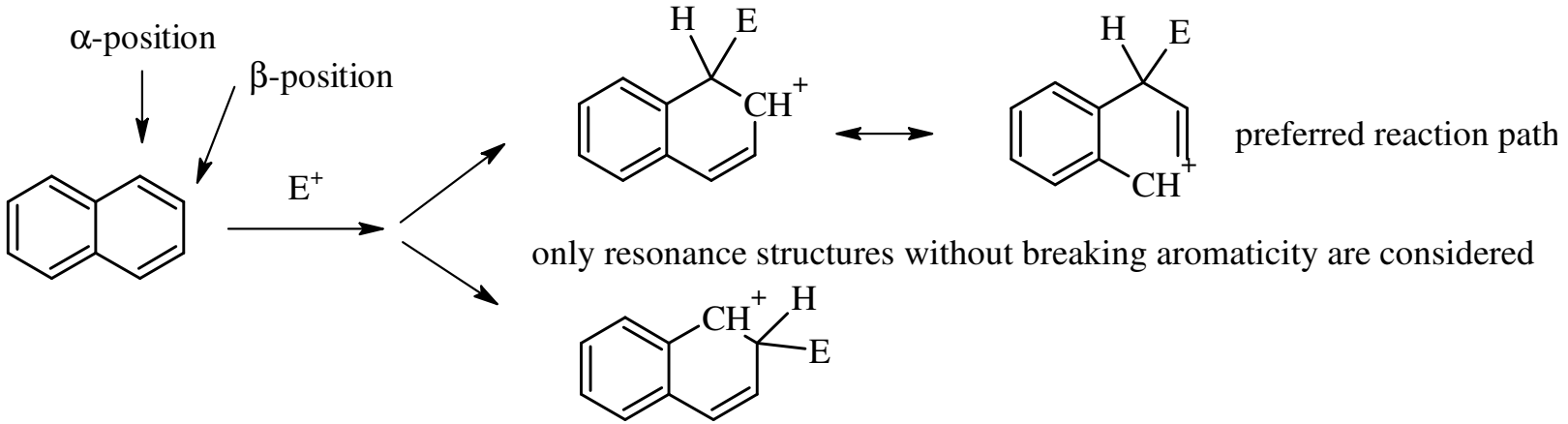


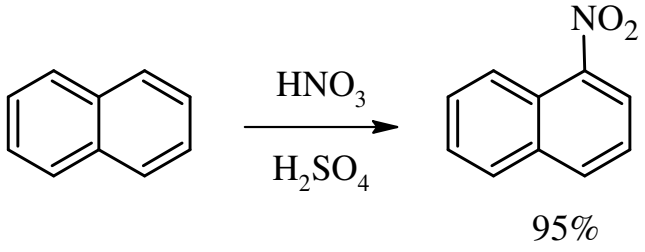
phenanthrene



pyrene

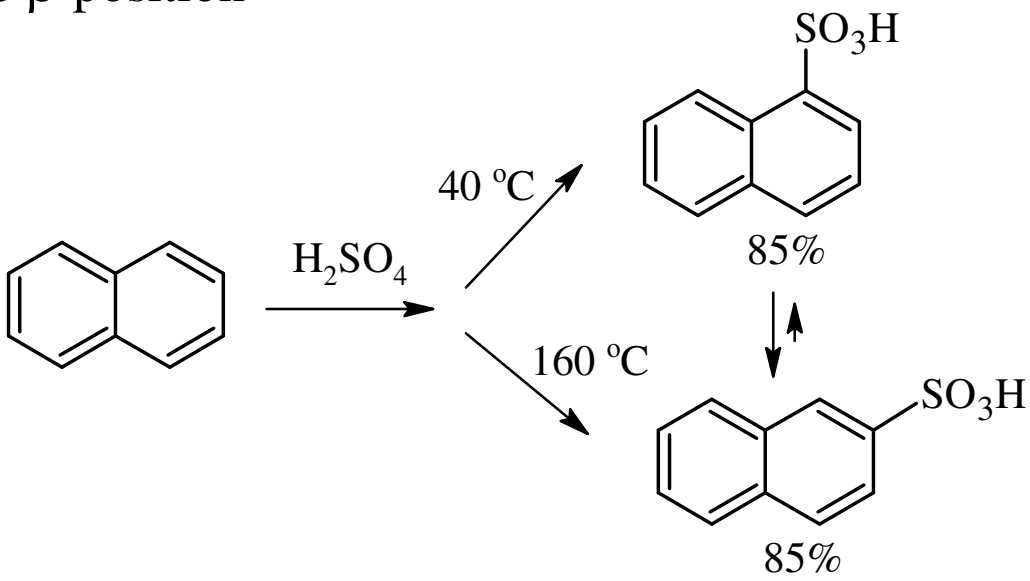
Orientation of the electrophilic substitution on the example of naphthalene



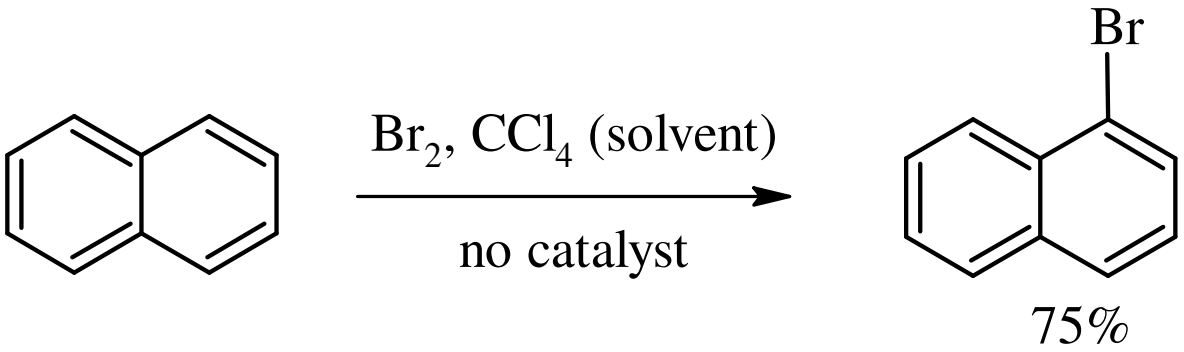


95%

When the reaction system is close to the equilibrium, substitution is directed to the more stable β-position



Naphthalene is more reactive, than benzene



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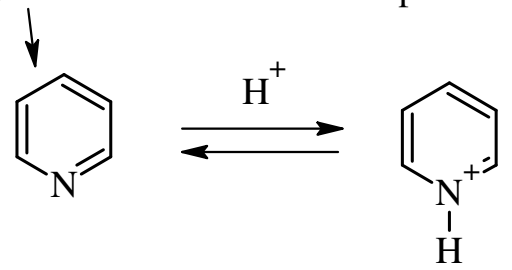
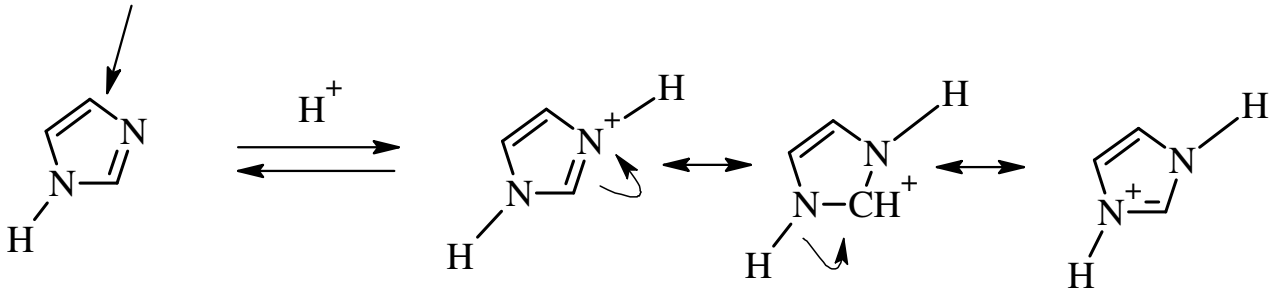
2. Basicity and acidity of the nitrogen heterocycles

Pyridine is a base due to the presence of a lone electron pair



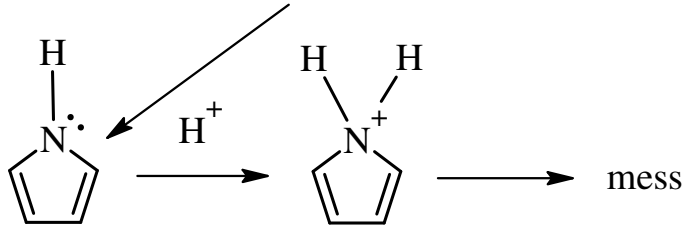
$pK_a = 5.2$

Imidazole is a stronger base due to stabilization of the conjugate acid

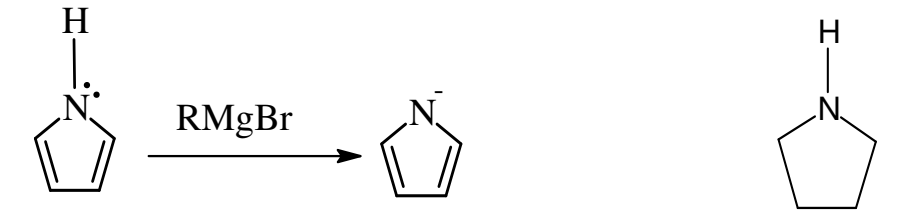


$pK_a = 6.95$

Acidification of pyrrole breaks aromaticity of the system and produces a messy mixture



Pyrrole is a stronger acid, than secondary amines, due to the aromatic stabilization of the conjugate base



$pK_a = 23$

$pK_a = 44$

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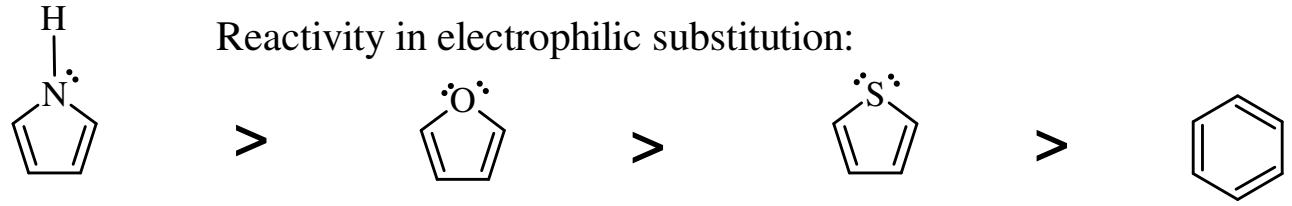
All three heterocycles have an atom with at least one lone electron pair, involved to the aromatic conjugation. It is evidenced both by physical and chemical properties.

Reactivity in electrophilic substitution:



μ = 0.7 D
b.p. = 31.4 °C

μ = 1.7 D
b.p. = 67 °C

THANK YOU