

## Implementing Synthetic Strategies

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## Considerations

- From last class
  - Construction of carbon skeleton
  - Functional group conversions
  - Regiochemical control
  - Stereochemical control
- New considerations
  - Solvent/Solubility
  - Side Reactions

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## Solvent/Solubility

- Many reagents are salts (soluble in/stabilized by polar solvents)
- Many organic molecules are nonpolar (and NOT soluble in polar solvents)
- Solution
  - Phase transfer catalysts: substances that are able to promote the transfer of salts into organic solvents

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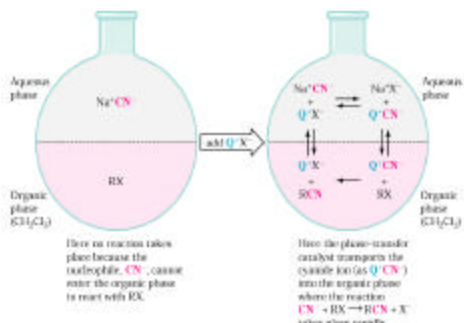
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## Phase Transfer Catalysts




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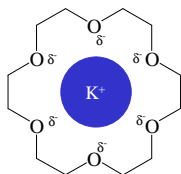
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## Crown Ethers

- Crown ethers present a hydrophobic outer surface, and thus dissolve easily in nonpolar solvents
- Their internal cavity, however, is lined with partially negative oxygen atoms, which interact strongly with cations of the appropriate size
- When cations are drawn into solution, the anions follow



18-crown-6

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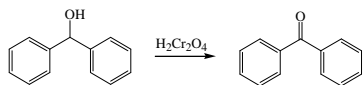
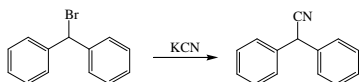
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## Problem

- What solvent might you choose for the following reactions, and which might require a phase-transfer catalyst?




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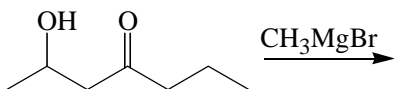
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## Side Reactions

- Desirable organic compounds often have multiple functional groups, many of which will react with the same reagents
  - Example: the following Grignard reaction does NOT produce 4-methyl-2,4-heptandiol. What is produced instead?




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## Prevention of Side Reactions

- Protecting Groups
  - Functional groups that might perform undesired reactions can be converted to a different functional group that is inert to the conditions that will be used (called a protecting group)
  - These protecting groups should be easily removable under other conditions in order to regenerate the initial functional group

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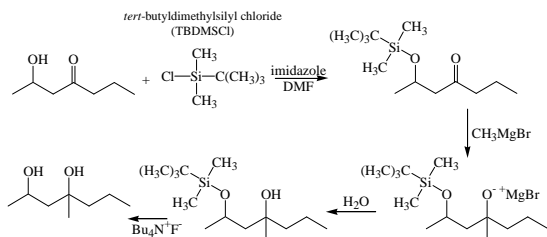
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## Protecting Group Example



Silyl chlorides react with alcohols to form silyl ethers

Silyl ethers can specifically be converted back to alcohols with fluoride ion

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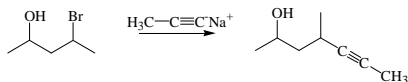
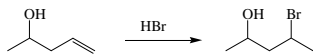
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## Problem

- Which of the following reactions will not produce the listed product due to side reactions (and would therefore require the use of a protecting group)?



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## Problem

- Form small groups (2-3 people)
- Devise two syntheses for *meso*-2,3-butanediol starting with acetylene (ethyne) and methane. Your two pathways should take different approaches during the course of the reactions for controlling the origin of the stereochemistry required in the product.

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