Solutions to Exercises, Chapter 10

10.1

(a) propan-1-ol  
(b) 1-phenylethanol  
(c) ethyl 3-hydroxymethylbenzoate

10.2  (a) and (b): the same as for Exercise 10.1.

(c) 1,3-bis(hydroxymethyl)benzene

10.3  React the following pairs of compounds with H$_2$/Ni or NaBH$_3$CN at pH 6.

(a) benzaldehyde + NH$_3$  
(b) cyclic ketone + NH$_3$  
(c) H$_2$C=O + NH$_2$-cyclohexylamine  
(d) cyclic ketone + PhNH$_2$

10.4

H$^+$ transfer

10.5
10.6

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\begin{align*}
\text{PhCH}_2\text{OH} & \quad \text{OH} & \quad \text{Me} \\
\text{PhCHMe} & \quad \text{Et} & \quad \text{Me} \\
\text{Me} & \quad \text{D}
\end{align*}
\]

10.7

(a) \[\text{Ph} - \text{C} - \text{OH} \quad \text{Me} \quad \text{Me}\]
(b) \[\text{OH} \]
(c) \[\text{O} \quad \text{Ph} - \text{C} \]
(d) \[\text{PhCO}_2\text{H} \]

10.8

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\begin{align*}
\text{Ph}_2\text{CO} & \xrightarrow{1) \text{LiAlH}_4, \text{Et}_2\text{O} \quad 2) \text{H}_2\text{O}^+} \text{Ph}_2\text{CHOH} \\
\text{PhBr} & \xrightarrow{1) \text{Mg}, \text{Et}_2\text{O} \quad 2) \text{PhCHO} \quad 3) \text{H}_2\text{O}^+} \text{Ph}_2\text{CHOH}
\end{align*}
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10.9 All the alcohols given have an ethyl group on the carbon bearing OH, so \text{EtMgBr} is the common Grignard reagent and is reacted with the following carbonyl compounds: aqueous workups give the required alcohols.

(a) \[\text{CH}_2\text{O} \quad (b) \text{PhCHO} \quad (c) \]

10.10 An ester carbonyl is less electrophilic than a ketone carbonyl due to the electron-donating resonance effect of the alkoxy oxygen (see Section 9.4.3), so nucleophilic attack at the (protonated) ketone group is the preferred reaction.