

PROBLEM SET # 22

Reactions of Carboxylic Acids and Nitriles

20.33 How could you convert butanoic acid into the following compounds? Write each step showing the reagents needed.

- (a) 1-Butanol (b) 1-Bromobutane (c) Pentanoic acid
(d) 1-Butene (e) Octane

20.36 How would you prepare the following compounds from benzene? More than one step is required in each case.

- (a) *m*-Chlorobenzoic acid (b) *p*-Bromobenzoic acid
(c) Phenylacetic acid, $C_6H_5CH_2CO_2H$

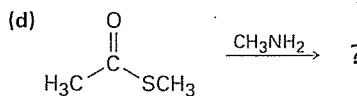
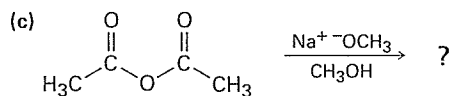
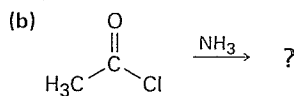
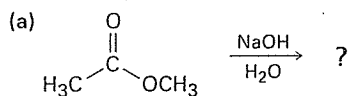
20.37 Predict the product of the reaction of *p*-methylbenzoic acid with each of the following:

- (a) $LiAlH_4$, then H_3O^+ (b) *N*-Bromosuccinimide in CCl_4
(c) CH_3MgBr in ether, then H_3O^+ (d) $KMnO_4$, H_3O^+

20.52 *p*-Aminobenzoic acid (PABA) is widely used as a sunscreen agent. Propose a synthesis of PABA starting from toluene.

Problem 21.5

Predict the products of the following nucleophilic acyl substitution reactions:



21.39 Predict the product(s) of the following reactions:

