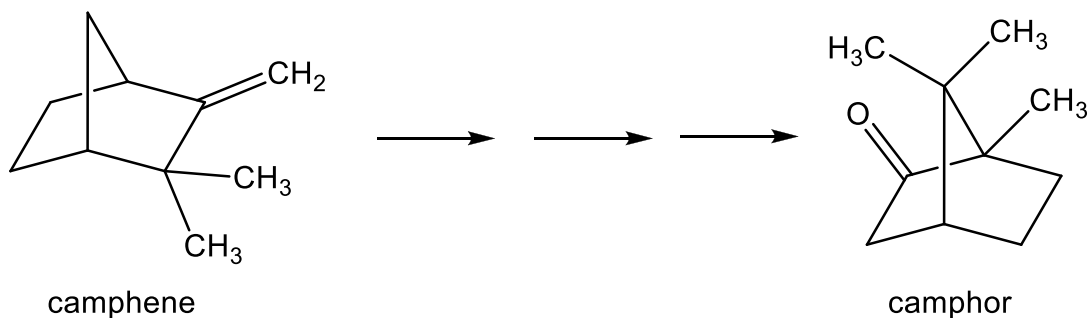


### Exercise 5 : - Acid-Base Reactions

1. Camphor is terpene which has many varied uses such as a plasticizer and in fireworks. Even though it is a naturally occurring compound, the high demand for this compound requires an additional synthetic source. Camphene is a readily available terpene and is used in the synthesis. The first step in the reaction involves treatment of camphene with an acetic acid/sulfuric acid mixture.

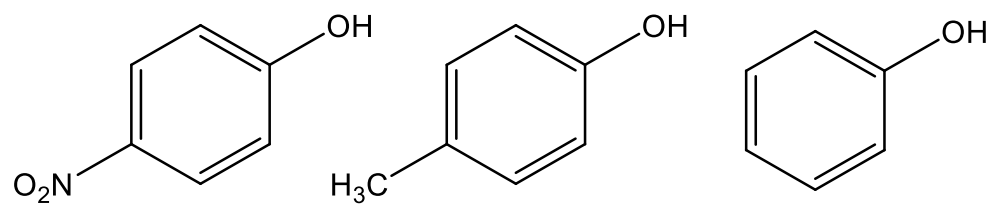


Write an equation for the first step in this synthetic sequence.

2. The following table lists  $pK_a$  values for a selection of acids in aqueous solution:

Acid	$pK_a$	Acid	$pK_a$	Acid	$pK_a$
HI	-10	$\text{CH}_3\text{OH}_2^+$	-2,5	$\text{CH}_3\text{OH}$	16
$\text{H}_2\text{SO}_4$	-9	$\text{H}_3\text{O}^+$	-1.74	$(\text{CH}_3)_2\text{C}=\text{O}$	19.2
HBr	-9	$\text{CH}_3\text{CO}_2\text{H}$	4.75	$\text{HC}\equiv\text{CH}$	25
HCl	-7	$\text{NH}_4^+$	9.2	$\text{NH}_3$	38
$(\text{CH}_3)_2\text{OH}^+$	-3.8	$\text{C}_6\text{H}_5\text{OH}$	9.9	$\text{H}_2\text{C}=\text{CH}_2$	44
$(\text{CH}_3)_2\text{C}=\text{OH}^+$	-2.9	$\text{CH}_3\text{NH}_3^+$	10.6	$\text{C}_2\text{H}_6$	50

- a. Will dimethyl ether,  $(\text{CH}_3)_2\text{O}$ , dissolve in concentrated sulfuric acid,  $\text{H}_2\text{SO}_4$ ? Explain your answer.
- b. Will dimethyl ether,  $(\text{CH}_3)_2\text{O}$ , dissolve in acetic acid,  $\text{CH}_3\text{CO}_2\text{H}$ ? Explain your answer.
3. Arrange the following compounds in order of decreasing acidity:
- a.
- $\text{CH}_3\text{CH}_2\text{CH}_3$     $\text{H}_3\text{CC}\equiv\text{CH}$     $\text{CH}_3\text{CH}=\text{CH}_2$
- b.



c.

