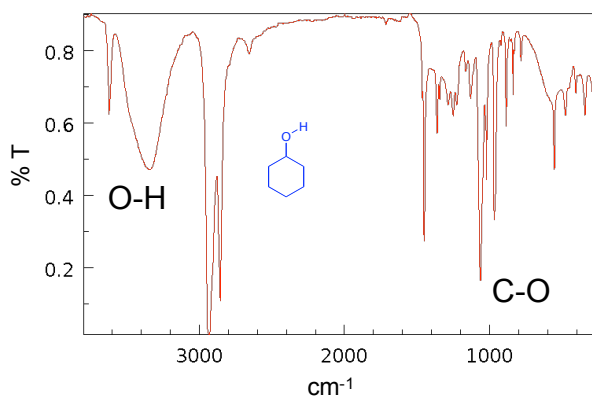


### 15.14 Spectroscopic Analysis of Alcohols and Thiols:

Infrared (IR): Characteristic O–H stretching absorption at 3300 to 3600  $\text{cm}^{-1}$

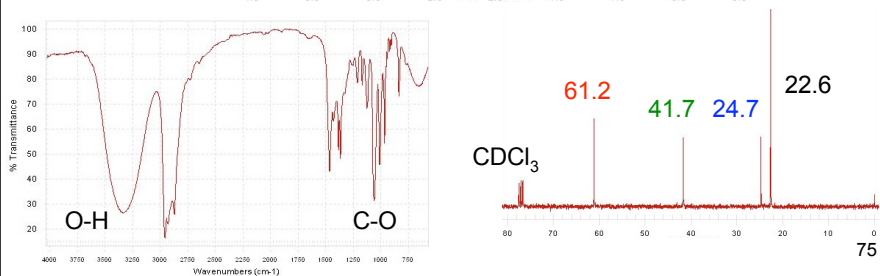
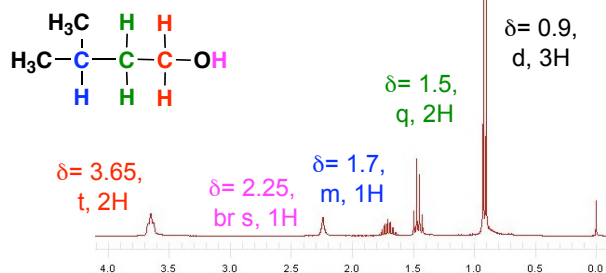
Sharp absorption near 3600  $\text{cm}^{-1}$  except if H-bonded:  
then broad absorption 3300 to 3400  $\text{cm}^{-1}$  range

Strong C–O stretching absorption near 1050  $\text{cm}^{-1}$



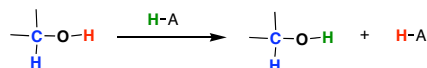
74

$^1\text{H}$  NMR: protons attached to the carbon bearing the hydroxyl group are deshielded by the electron-withdrawing nature of the oxygen,  $\delta$  3.3 to 4.7



75

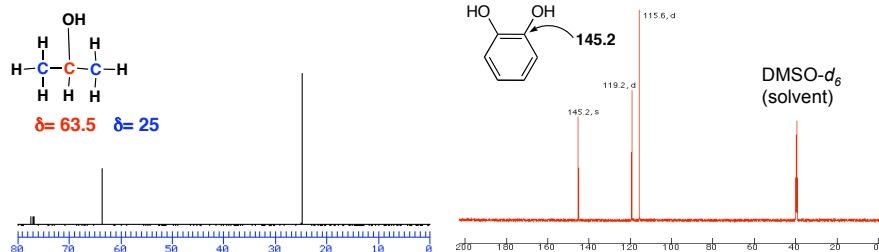
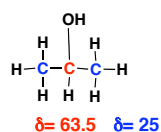
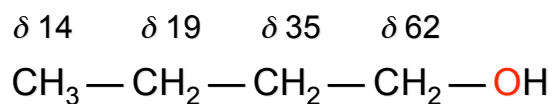
Usually no spin-spin coupling between the O–H proton and neighboring protons on carbon due to exchange reaction



The chemical shift of the -OH proton occurs over a large range (2.0 - 5.5 ppm). Its chemical shift is dependent upon the sample concentration and temperature. This proton is often observed as a broad singlet (br s). Exchangable protons are often not to be observed at all.

76

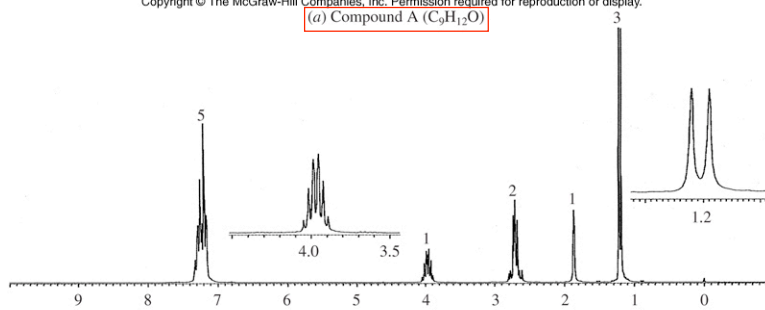
<sup>13</sup>C NMR: The oxygen of an alcohol will deshield the carbon it is attached to. The chemical shift range is 50-80 ppm



77

15.48 (fig 15.8, p. 658)

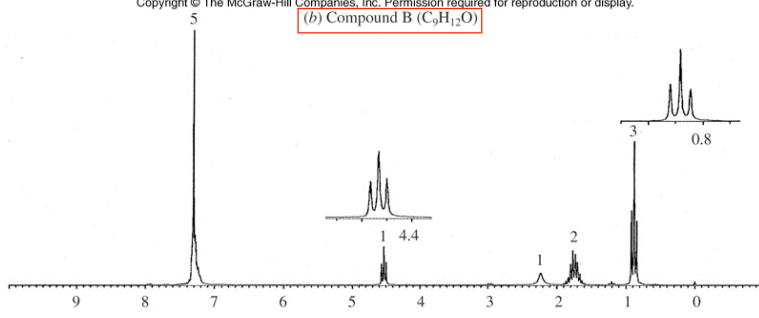
Copyright © The McGraw-Hill Companies, Inc. Permission required for reproduction or display.  
 (a) Compound A ( $C_9H_{12}O$ )



$^{13}C$ : 138.6  
 129.4  
 128.4  
 126.3  
 68.8  
 45.8  
 22.7

Copyright © The McGraw-Hill Companies, Inc. Permission required for reproduction or display.

(b) Compound B ( $C_9H_{12}O$ )



$^{13}C$ : 145.2  
 128.8  
 127.8  
 126.5  
 76.3  
 32.3  
 10.6

78

Chemical shift ( $\delta$ , ppm)