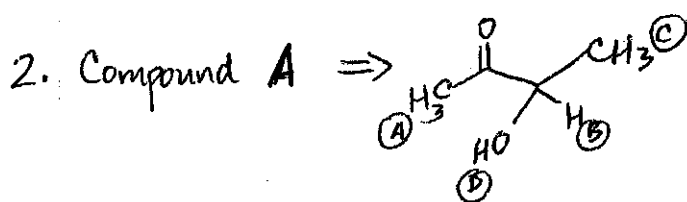
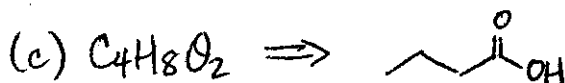
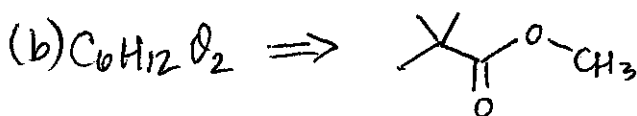
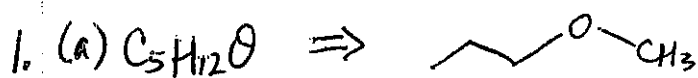


## PROBLEM SET #2 SOLUTIONS



(A) 2.15 ppm, s

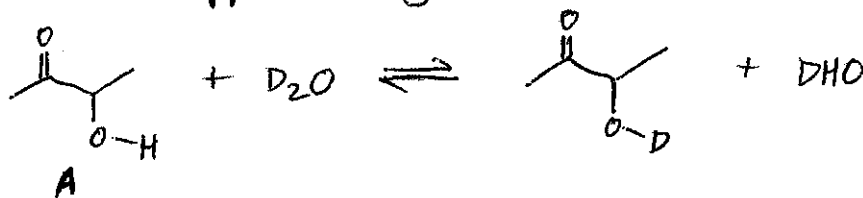
(B) 4.25, q

(C) 1.35, d

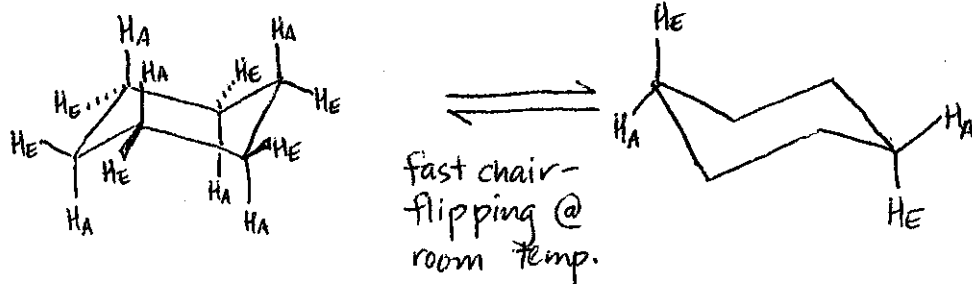
(D) 3.75, broad s

IR @  $1720\text{ cm}^{-1} \equiv \boxed{C=O}$ 

When dissolved in  $D_2O$ , in compound A, proton H<sup>(D)</sup> is replaced by a deuterium. 'D's do not appear in  $^1H$  NMR spectra, so that the peak at 3.75 ppm no longer is visible.



3.



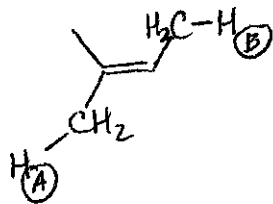
(see explanation next pg.)

At room temp, axial and equatorial H's are rapidly inter-converted via chair flipping. The  $^1\text{H}$  NMR experiment thus detects an "average" type of H.

When the temp. is lowered, chair flipping slows (not enough thermal energy available to surmount the energy barrier to flip). With slowed, i.e., "frozen-out," chair flips, the  $^1\text{H}$  NMR expt sees BOTH axial H's and equatorial H's  
 $\therefore$  more complicated spectrum.



With NBS present, we have a radical reaction here. There are two types of allylic H's that can be abstracted,  $\text{H}_\text{A}$  and  $\text{H}_\text{B}$ .



Draw all radical intermediates:

