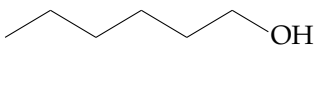
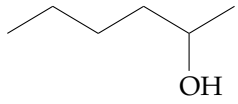
Self Test 5 (Units 12-14)

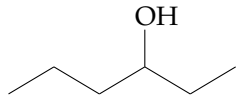
1. A vial containing an unknown alcohol was discovered on the bench. The label had become smudged, so that the numerical prefix was illegible: all that could be read was that the sample contained hexan-#-ol (where "#" could equal 1, 2 or 3). The mass spectrum was obtained, and contained the expected M^+ peak (m/z = 102). In addition, there were major fragmentation peaks at (m/z = 73) and (m/z = 59). Identify the alcohol.



hexan-1-ol

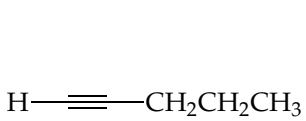


hexan-2-ol

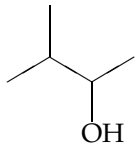


hexan-3-ol

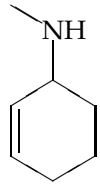
2. Match the following compounds with the appropriate set of IR absorptions.



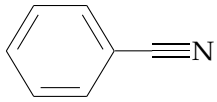
A



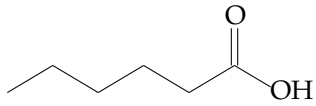
B



C



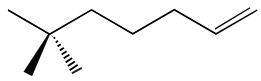
D

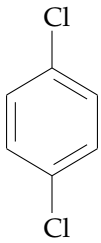


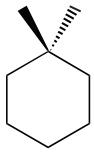
E

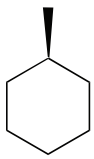
Compound	Absorptions (cm^{-1})
_____	2875-2975—several peaks, medium 3314—strong 2272—weak
_____	2822-2994—several peaks, medium 3340—weak, broad 1645—weak
_____	2872-2971—several peaks, medium 3500-2612—medium, very broad 1742—strong
_____	2917-2933—several peaks, medium 3401—strong, broad
_____	3083-3017—several peaks, medium 2241—strong 1595, 1541—weak

3. Indicate the number of signals (ignoring coupling) that you would see in the ^{1}H NMR spectra of the following compounds.

a. 

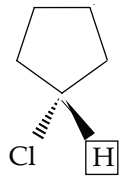
b. 

c. 

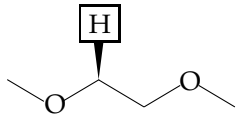
d. 

4. For each of the following compounds, estimate the chemical shift of the indicated proton and sketch the expected ^{1}H NMR signal as you would expect it to appear, accounting for any coupling/splitting.

a.



b.



5. An unknown compound with the formula $C_3H_6O_2$ was subjected to ^{1}H NMR analysis, the results of which are listed below. Propose a reasonable structure for the unknown compound.

Signal	**δ (ppm)**	**# of Hs**	**Multiplicity**
A	11.73	1	broad, *s*
B	2.38	2	*q*
C	1.16	3	*t*

6. Rank the following four isomeric dienes in order of increasing stability (i.e., 1 = most stable, 4 = least stable):

   ____ hexa-1,5-diene

   ____ *cis* hexa-1,4-diene

   ____ *trans* hexa-1,4-diene

   ____ *trans* hexa-1,3-diene

7. Provide the organic starting materials most suitable for the synthesis of the following compound *via* a Diels-Alder reaction. Circle the dienophile.