1. Nuclear Overhauser Effect, NOE, is:

   a) the name given to the reason magnetic moment preccess in a magnetic field.
   b) the effective coupling between one nuclei and a neighboring nuclei.
   <u>c) the enhanced intensity one gets in a C-13 spectrum when the H attached to it is decoupled.</u>
   d) the effect one gets by giving a nuclei a 180 degree pulse.

2. For a proton spectrum on a 60 MHz instrument, 1 ppm corresponds to _____ Hz.

For problems 3-5. Consider the NMR of 3-pentanone $(CH_3CH_2)CO$ [or $CH_3CH_2C(O)CH_2CH_3$].
3. The proton spectrum will consist (from high chemical shift to low) :

   a) a singlet, and a multiplet (splitting greater than 4) and a triplet
   <u>b) a quartet, and a triplet</u>.
   c) a two doublets and two triplets..
   d) two triplets and two quartets
   e) a triplet, and a doublet

4. From the highest chemical shift to the lowest, integration of the peaks in the proton spectrum will be:

   <u>a) 2:3</u>   b) 2:2:3:3   c) 1:2:3   d) 3:2:2:3   e) none of these

5. The decoupled carbon spectrum will consist of _____ peak(s).

   a) 2   <u>b) 3</u>   c) 4   d) 5   e) none of these

6. The proton frequency on a magnet with a field of 200 MHz is 46000 gauss. What is the field strength on an instrument when the proton frequency is 60 MHz?

   <u>a) 13800 gauss</u>   b) 153333 gauss   c) 4140 gauss   d) none of these

Consider ethyl benzene; $C_6H_5CH_2CH_3$
                         (a) (b) (c)

7. The **b** protons in the **proton** spectrum will be :

   a) a 1:2:1 triplet   d) a 1:1 doublet
   <u>b) a 1:3:3:1 quartet</u>   e) none of these
   c) a 1:1:1 triplet

8. The **c** protons in the **proton** spectrum will be :

   <u>a) a 1:2:1 triplet</u>   d) a 1:1 doublet
   b) a 1:3:3:1 quartet   e) none of these
   c) a 1:1:1 triplet

9. In the decoupled **C-13 spectrum** the 6 carbons of the phenyl ring will show up as :

   a) 6 peaks of equal intensity
   <u>b) 5 peaks of equal intensity and one of low intensity</u>
   c) 4 peaks of equal intensity
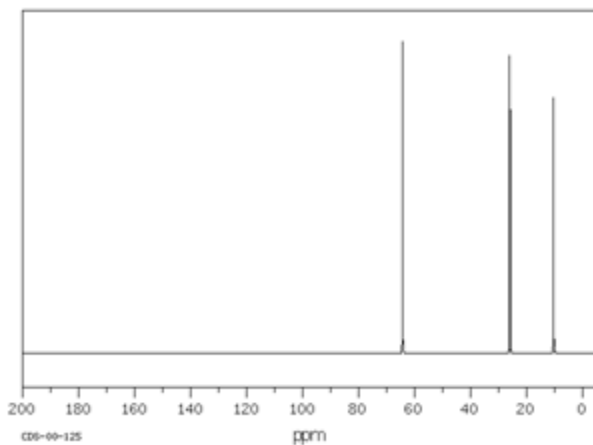   d) 4 peaks- two of larger intensity and two of lower but not necessarily equal intensity

10-12 Match these alcohols and their C-13 spectra.
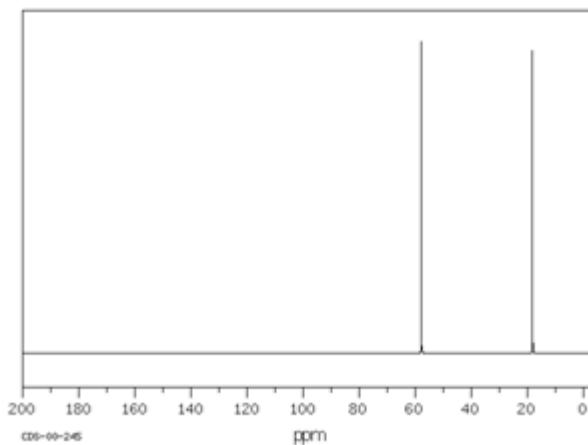
___C___ CH_3CH_2OH ethanol

___A___ CH3CH2CH2OH 1-propanol (n-propyl alcohol)

___B___ (CH3)2CHOH   2-propanol (i-propyl alcohol)

Spectrum **A** – all peaks of equal size

Spectrum **C** – peaks of equal size

200 180 160 140 120 100 80 60 40 20 0
CD6-00-125   ppm

200 180 160 140 120 100 80 60 40 20 0
CD6-00-245   ppm

Spectrum **B** – right peak twice height of left

200 180 160 140 120 100 80 60 40 20 0
CD6-00-521   ppm