Chem 242 exam 1 Jan 29, 2009 Name Ben Barnacke

1. (8 pts) Circle what is true about NMR.

(a) NMR stands for 'Nuclear Magnetic Resonance'.
(b) The electron density about a proton will determine the chemical shift.
(c) Protons that are 'upfield' are in electron rich environments
(d) Multiplicity (Splitting patterns) measure the number of hydrogen *neighbors*
(e) 'I had my spin flipped' is what chemists say when they fall in Love
f) Integration measures the number of neighboring protons.
g) The Tallest peak in an NMR spectra is called the 'base peak'.

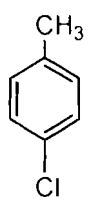
o.k. if not circled

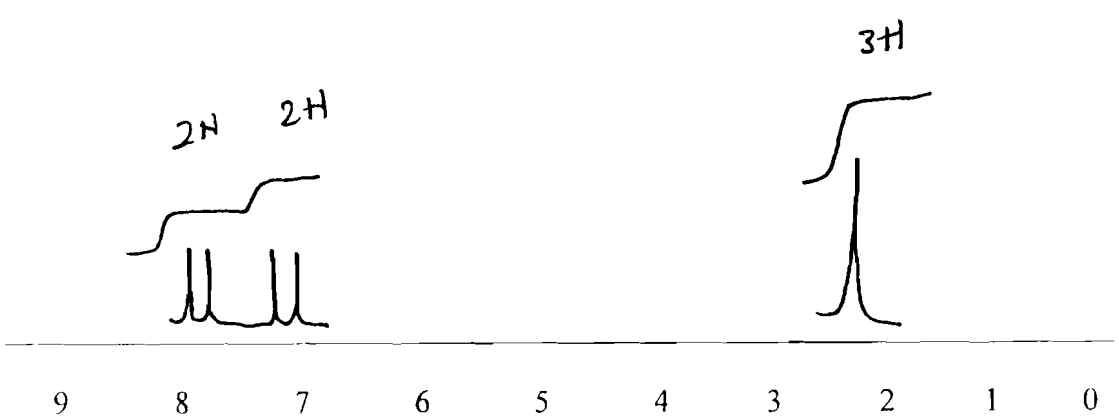
2. (8 pts) Circle what is true about IR

a) IR stands for "Insight Radical" spectroscopy
(b) The frequency (cm-1) of an IR absorption band depends on the bond strength..
c) In IR, 'downfield' is term used to describe absorption below 1500 cm-1.
d) IR spectroscopy gave rise to MRI (magnetic resonance imaging) technology.
(e) A single bond will absorb IR radiation at a *lower* frequency than a double bond.
f) The finger print region of the IR is 1600 and below and is dangerous place to look
(g) A broad peak is caused by hydrogen bonding

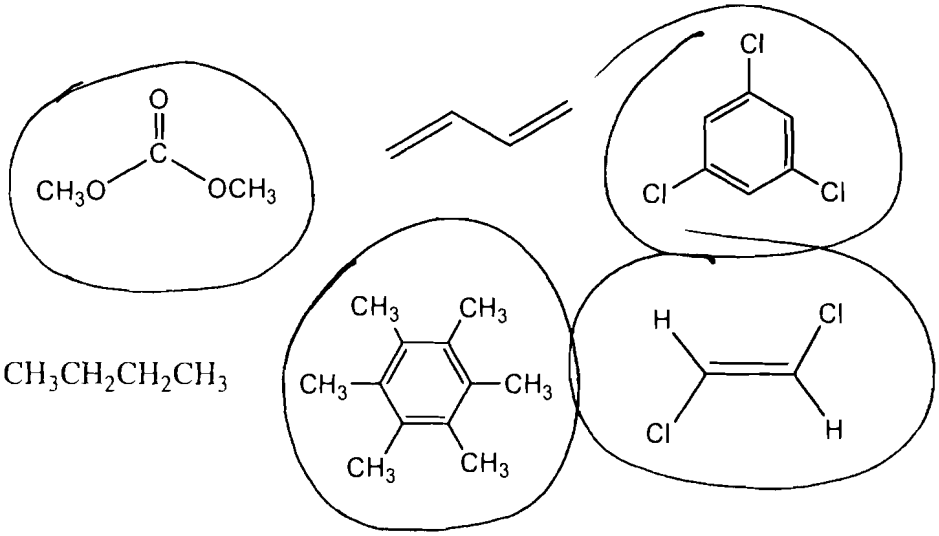
o.k if not circled

3. (8 pts) Draw the NMR spectrum for the compounds below. Be sure to include splitting and integration values (See the tables on the last page of the exam)



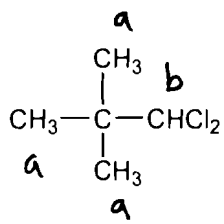


4. (8 pts) Circle the molecules below that would only give <u>one signal</u> (one peak) on the NMR

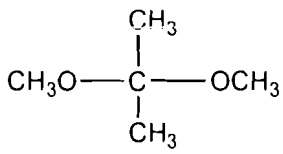


$CH_3CH_2CH_2CH_3$

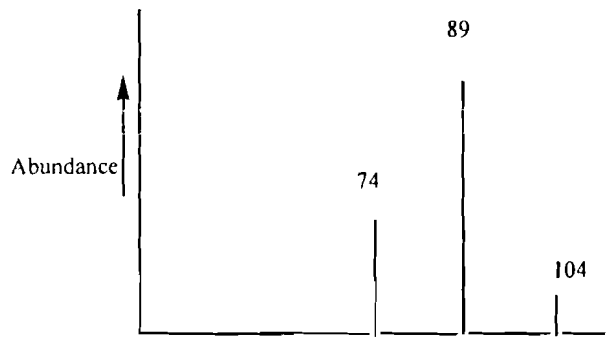
5. (4 pts) For the molecule shown below, label each set of equivalent protons using an 'a' for the set that is the furthest upfield in the NMR spectra and 'b', for the next furthest and so on.



6. The mass spec for the compound A below is shown.



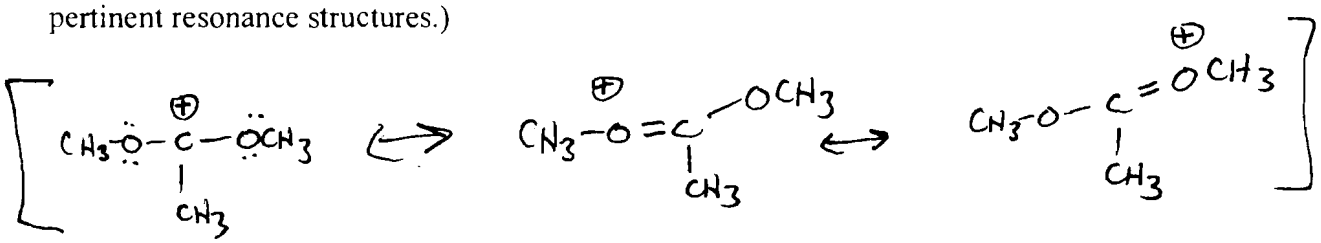
A



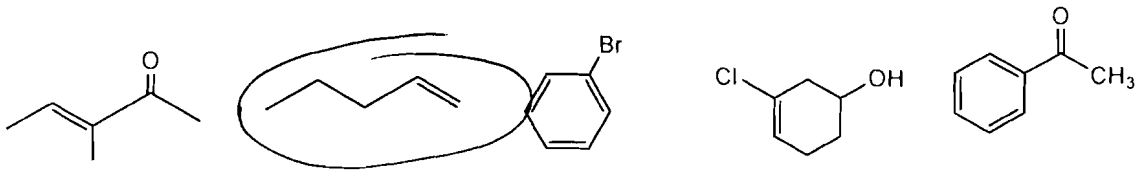
a) (3 pts) Which peak is the **molecular ion** peak? → 104

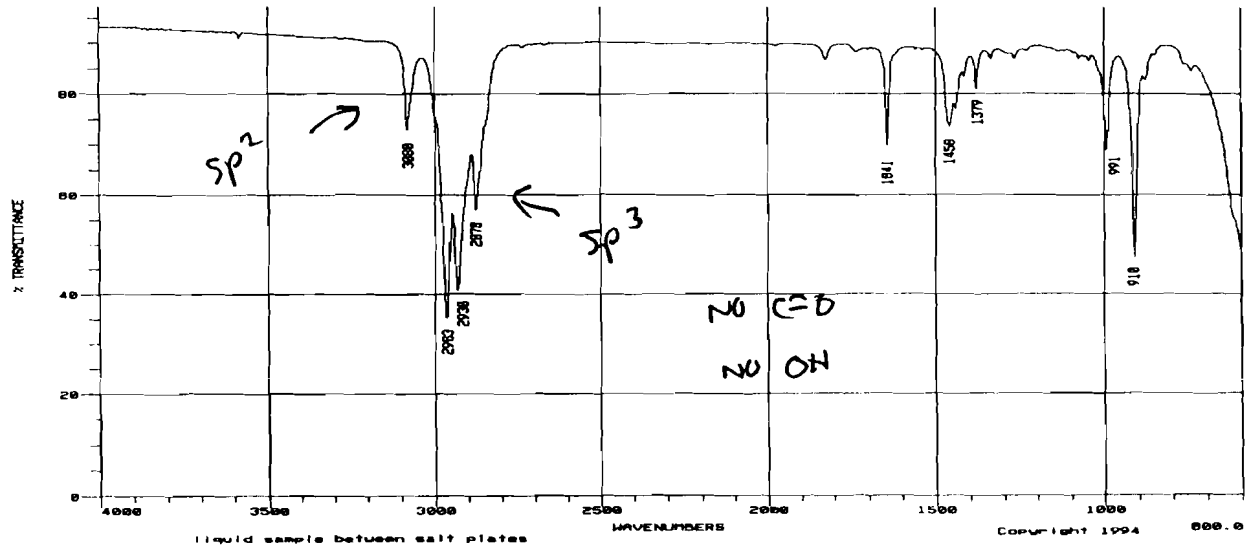
b) (2 pts) Which peak is the **base peak**? → 89

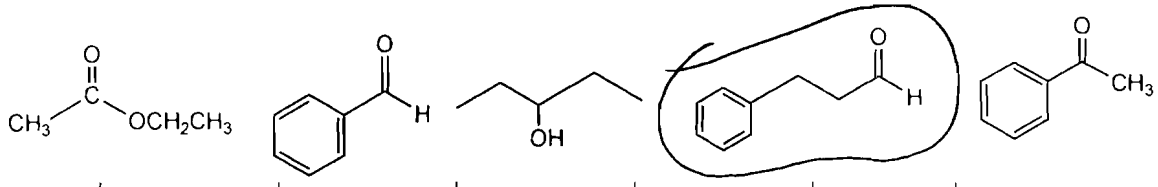
c) (5 pts) Draw the structure of the ion that represents the **base peak** (show all pertinent resonance structures.)

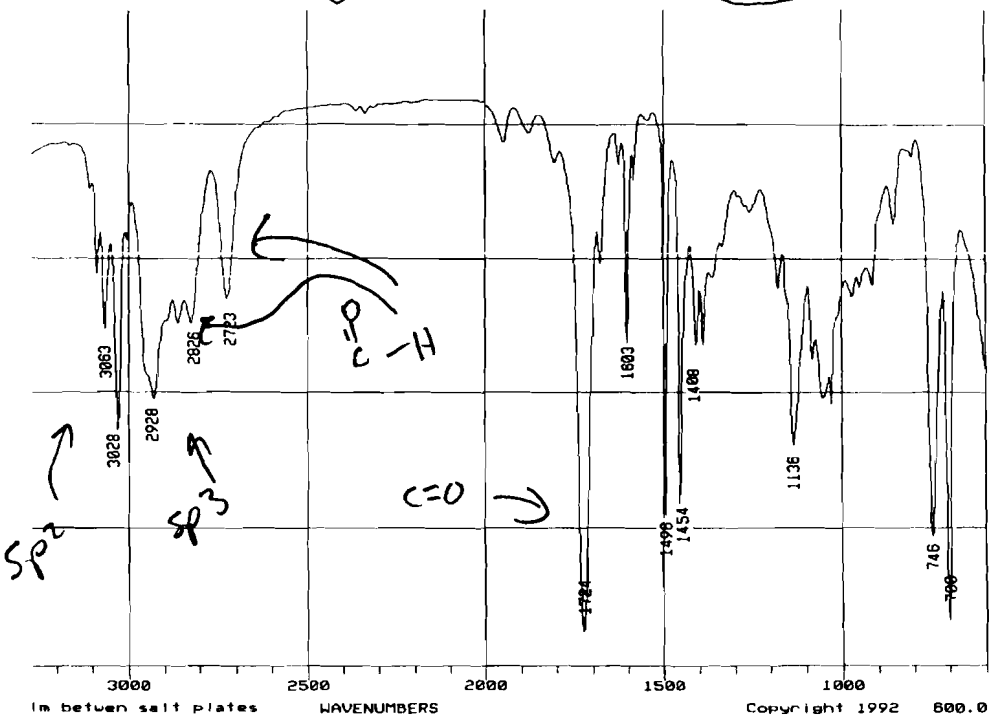


7. (12 pts-6 pts ea) Above each of the 2 IR spectra below there are 5 compounds that it could be. Circle the compound which would best match the IR spectra.

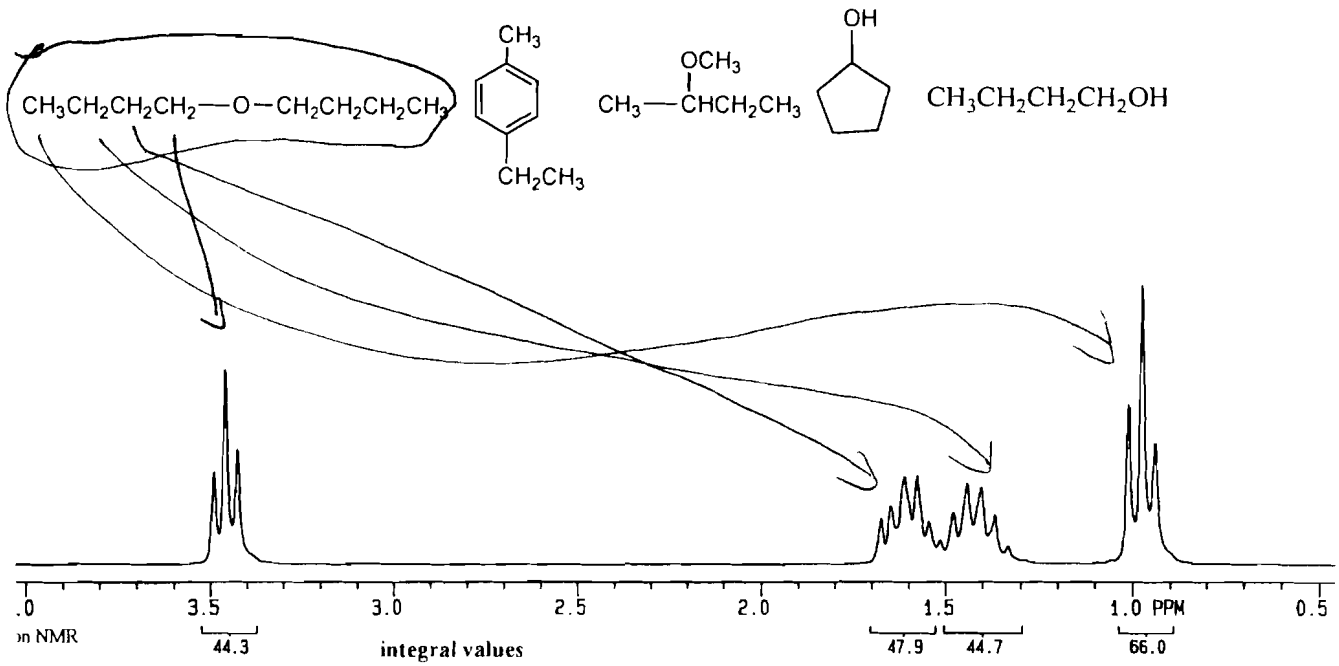






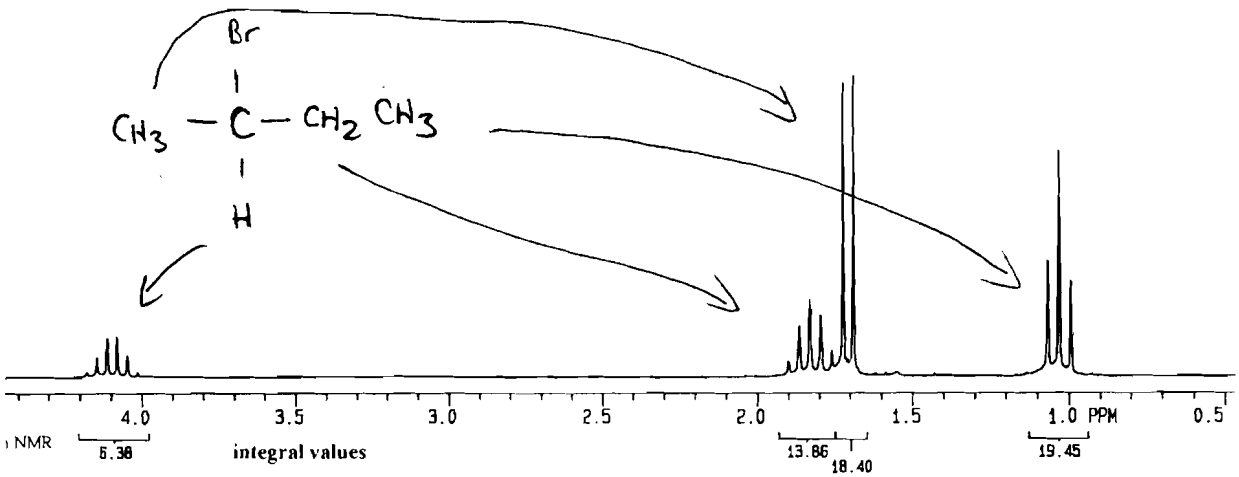


8. (6 pts) Above the NMR spectra below there are 5 compounds that it could be. Circle the compound which would best match the NMR spectra. Integration values are shown above the peaks.

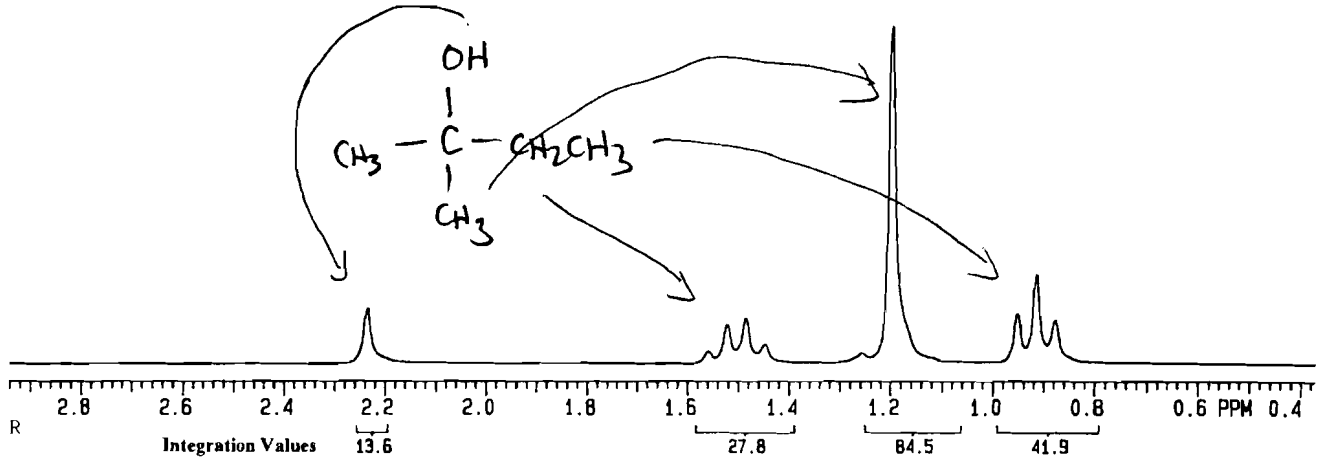


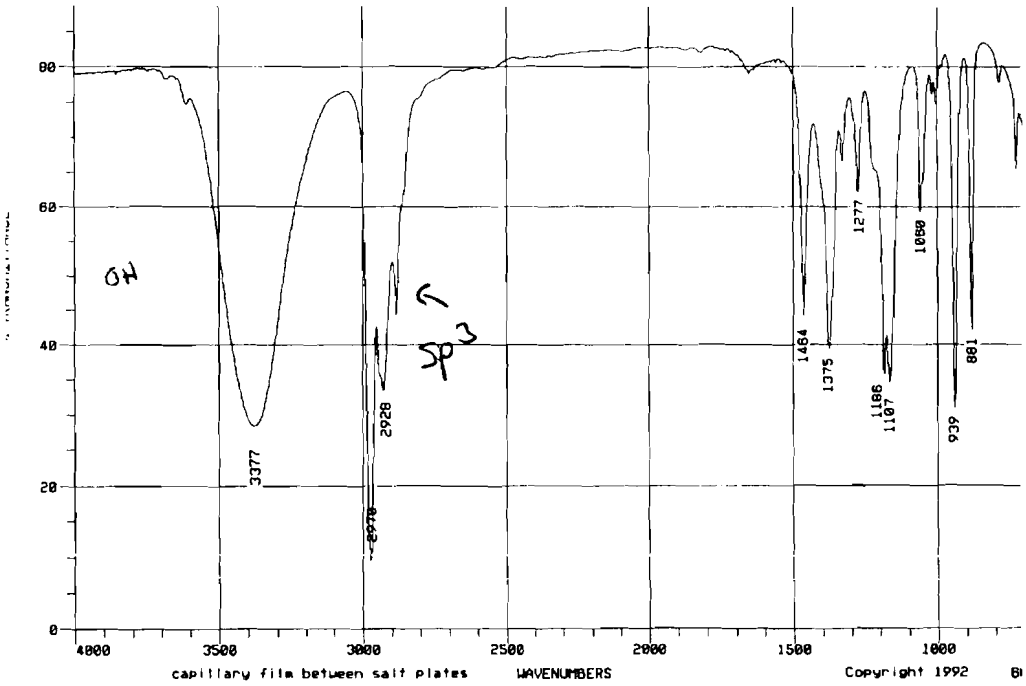
9. (6 pts) Draw the corresponding structure for the following molecular formula and NMR

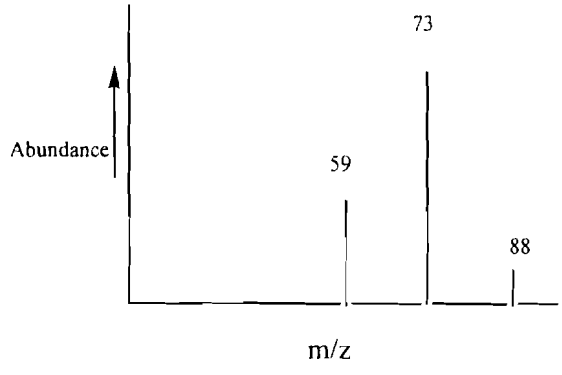
Molecular formula: C_4H_9Br



10. (10 pts) Give the structure for the following unknown using the NMR, IR and Mass spec data below:







Chem 242 exam 1 Jan 29, 2009 Name Alan Greenspan

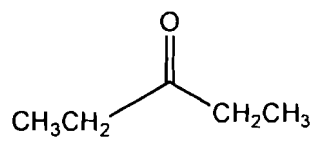
1. (8 pts) Circle what is true about NMR.

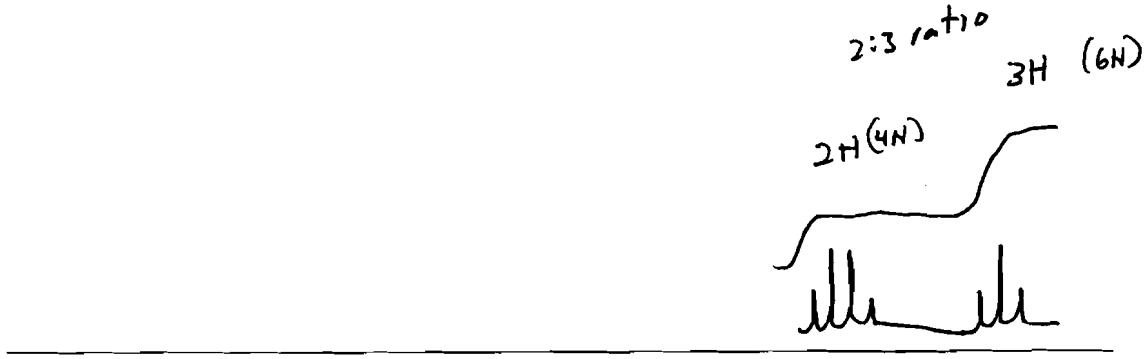
a) NMR stands for 'Nuclear Magneto Radiance'.
b) The electron density about a proton will determine the splitting pattern.
c) Protons that are 'down field' are in electron rich environments
d) Multiplicity (Splitting patterns) measure the number of hydrogen *neighbors*
e) The Tallest peak on an NMR spectra is called the 'base peak'
f) Integration measures the number of hydrogens that gave rise to the peak.
g) 'I had my spin flipped' is what chemists say when they fall in Love — o.k. if not circled.

2. (8 pts) Circle what is true about IR

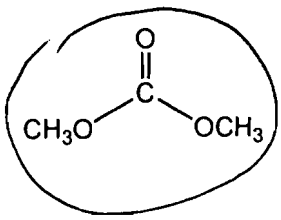
a) IR stands for "Infrared" spectroscopy
b) The intensity of an IR absorption band depends on the bond strength..
c) In IR, 'downfield' is term used to describe absorptions below 1600 cm-1.
d) The finger print region of the IR contains and carbonyl (C=O) stretch.
e) A single bond will absorb IR radiation at a *lower* frequency than a double bond.
f) IR spectroscopy gave rise to MRI (magnetic resonance imaging) technology
g) Broad peaks in the IR are due to hydrogen bonding.

3. (8 pts) Draw the NMR spectrum for the compounds below. **Be sure to include splitting and integration values**

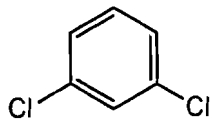


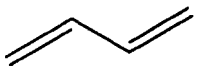


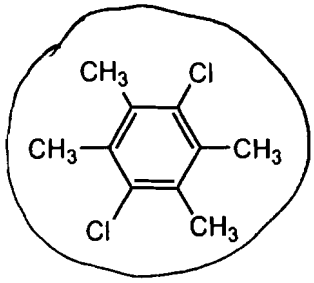
4. (8 pts) Circle the molecules below that would only give <u>one signal</u> (one peak) on the NMR

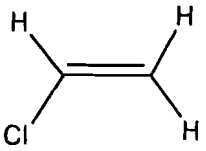


$CH_3CH_2CH_2CH_3$

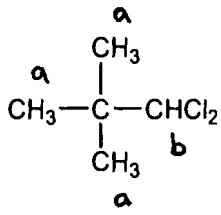




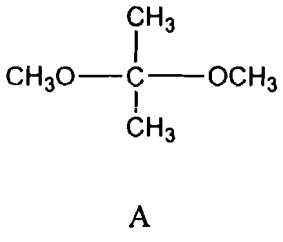




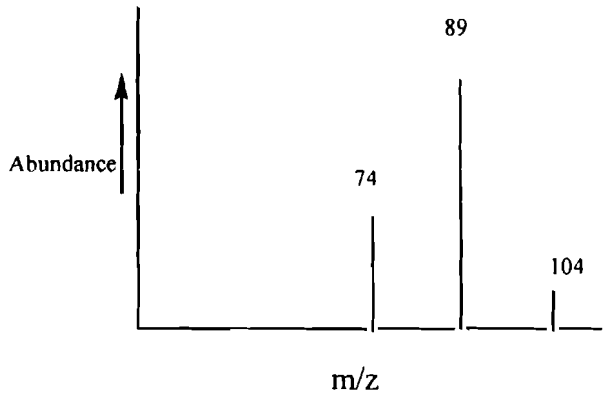
5. (4 pts) For the molecule shown below, label each set of equivalent protons using an 'a' for the set that is the furthest upfield in the NMR spectra and 'b', for the next furthest and so on.



6. The mass spec for the compound A is shown below.



A



a) (3 pts) Which peak is the **molecular ion** peak? → 104

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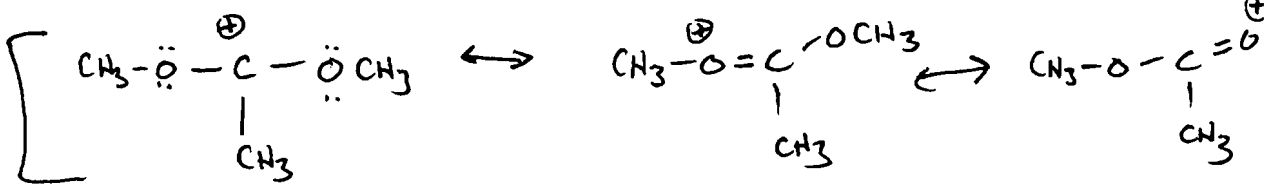
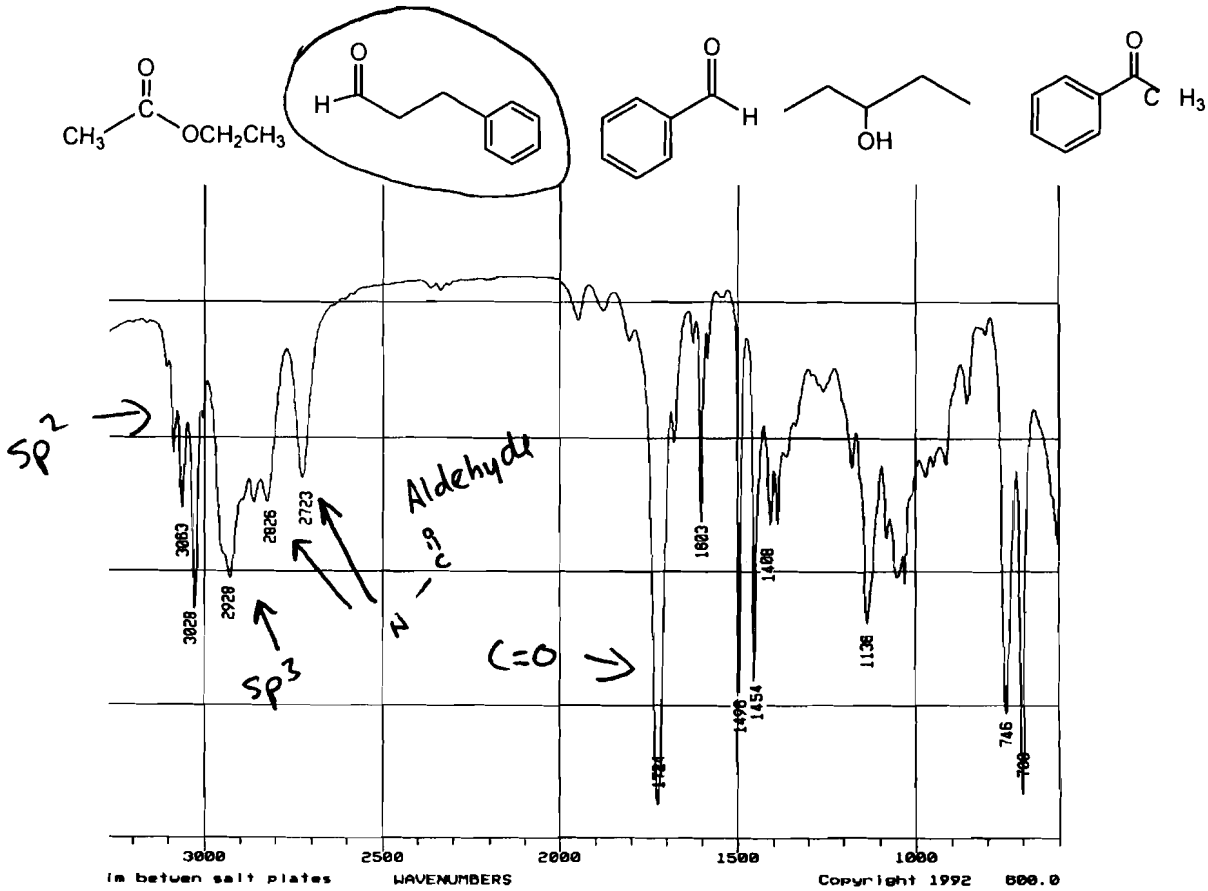
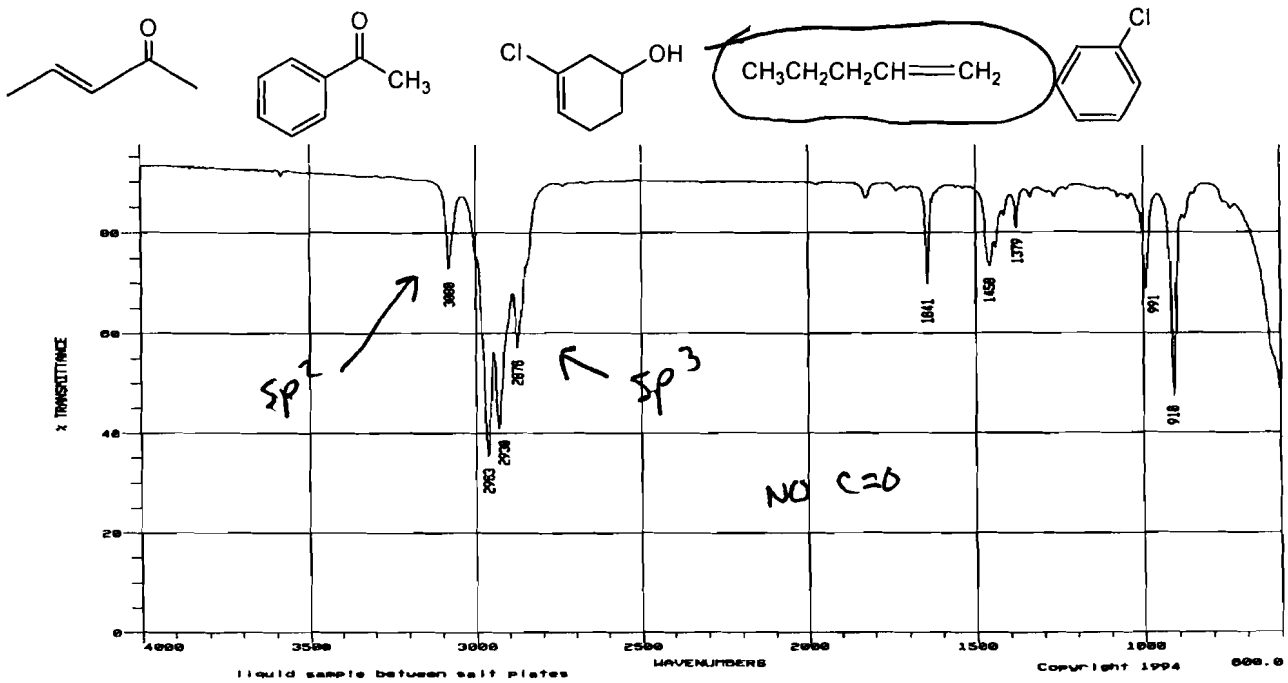
c) (5 pts) Draw the structure of the ion that represents the **base peak** (show all pertinent resonance structures.)



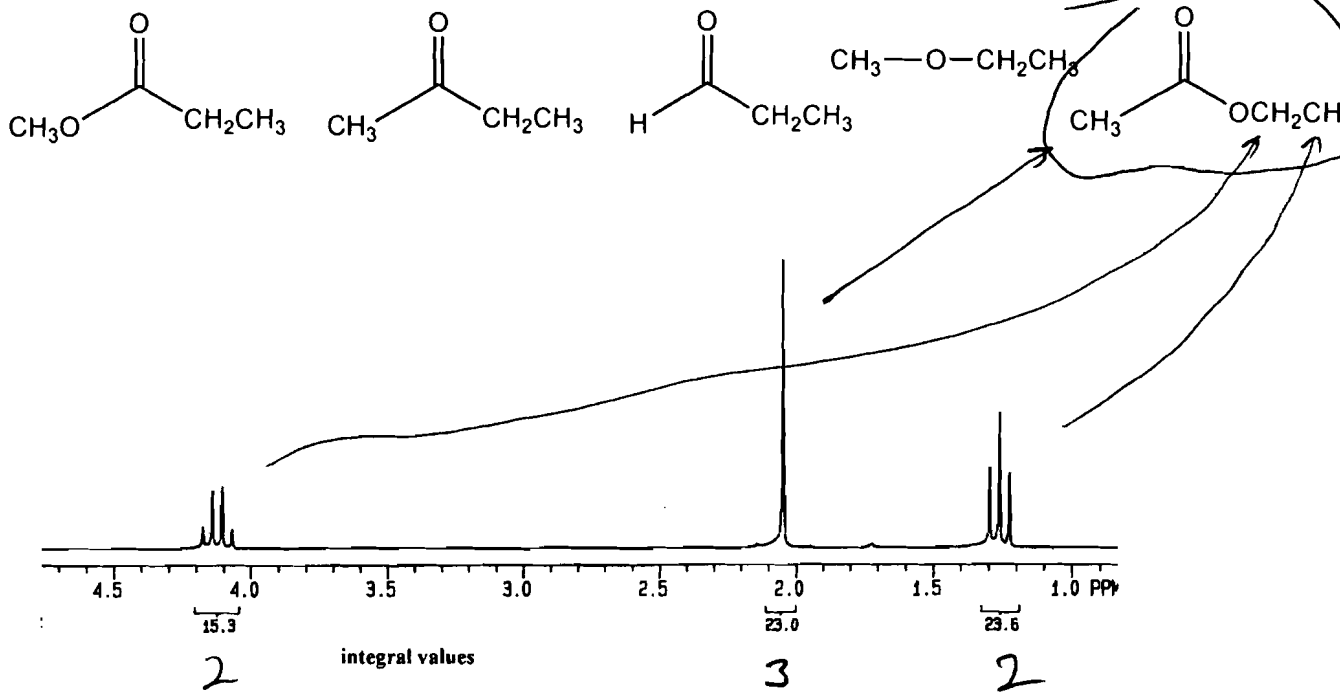
Very stable

7. (12 pts-6 pts ea) Above each of the 2 IR spectra below there are 5 compounds that it could be. Circle the compound which would best match the IR spectra.



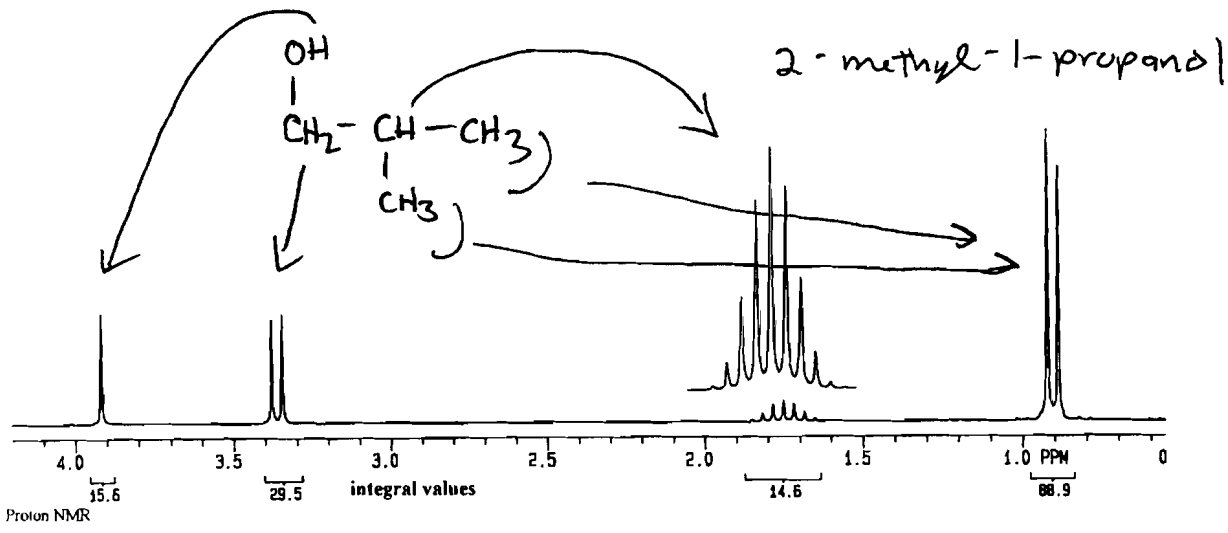


8. (6 pts) Above the NMR spectra below there are 5 compounds that it could be. Circle the compound which would best match the NMR spectra. Integration values are shown above the peaks.



9. (6 pts) Draw the corresponding structure for the following molecular formula and NMR (hint: this compound has a strong broad IR absorption at 3300 cm-1)

Molecular formula: $C_4H_{10}O$



10. (10 pts) Give the structure for the following unknown using the NMR, IR and Mass spec data below: