

**Chemistry 210 NMR Quiz**  
**October 31, 2007**

Name: \_\_\_\_\_

This quiz is due back on November 5, 2007 during lab.

Answers:

1. \_\_\_\_\_

2. \_\_\_\_\_

3. \_\_\_\_\_

4. \_\_\_\_\_

5. \_\_\_\_\_

6. \_\_\_\_\_

7. \_\_\_\_\_

8. \_\_\_\_\_

9. \_\_\_\_\_

10. \_\_\_\_\_

11. \_\_\_\_\_

12. \_\_\_\_\_

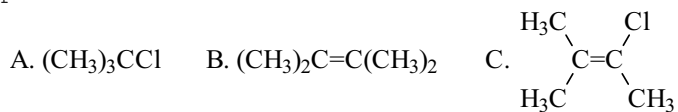
13. \_\_\_\_\_

14. \_\_\_\_\_

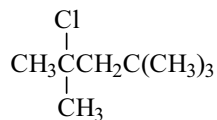
15. \_\_\_\_\_

*NOTE: Sometimes the Greek lettering does not always convert over to a pdf document, so I inserted the names for the appropriate Greek letters throughout the quiz. Good luck.*

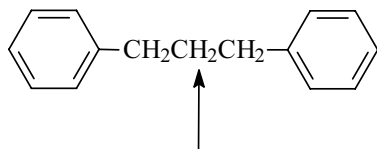
1. Which of the following has only a single peak in its proton NMR spectrum?



- 1) only A                      2) only B                      3) A and B                      4) A, B, and C
2. Which of the following gives the furthest downfield shift from TMS in its proton NMR spectrum?
- 1)  $(\text{CH}_3)_4\text{C}$                       2)  $(\text{CH}_3)_3\text{N}$                       3)  $(\text{CH}_3)_2\text{O}$                       4)  $\text{CH}_3\text{F}$
3. How many different sets of equivalent protons are there for *para*-xylene (1,4-dimethylbenzene)?
- 1) only 1                      2) two                      3) three                      4) four                      5) five
4. How many different sets of equivalent protons are there in the following compound?



- 1) three                      2) four                      3) five                      4) six
5. What is the multiplicity of the methylene hydrogens indicated in the proton NMR of the following compound?



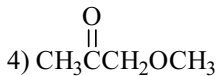
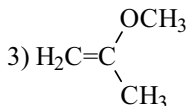
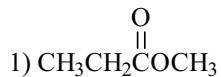
- 1) singlet  
2) doublet  
3) triplet  
4) quartet  
5) pentet

6. Which compound below fits the following proton NMR data?

triplet  $\delta$  1.22 (3H)

singlet  $\delta$  1.98 (3H)

quartet  $\delta$  4.07 (2H)



1) 1

2) 2

3) 3

4) 4

7. The proton NMR of 1,1-dibromoethane would appear as a:

1) downfield doublet and upfield quartet.

2) downfield quartet and upfield doublet

3) downfield doublet and upfield triplet.

4) downfield triplet and upfield doublet

8. The proton NMR of a compound,  $\text{C}_8\text{H}_9\text{ClO}$ , has the following peaks. Which compound below best fits the data?

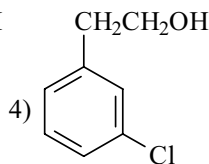
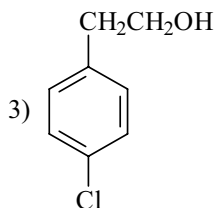
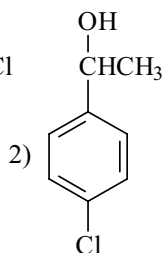
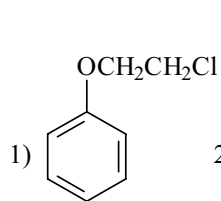
broad singlet  $\delta$  2.41 (1H)

triplet  $\delta$  2.75 (2H)

triplet  $\delta$  3.69 (2H)

doublet  $\delta$  7.02 (2H)

doublet  $\delta$  7.50 (2H)



1) 1

2) 2

3) 3

4) 4

9. A triplet and quartet pattern in  $^1\text{H}$  NMR often indicates the presence of a(an):

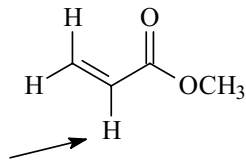
1) ethyl group.

2) propyl group

3) isopropyl group

4) a phenyl group

10. Which of the following describes the spin-spin splitting of the indicated H in the  $^1\text{H}$  NMR of the compound shown below?



- 1) singlet  
 2) doublet of doublets  
 3) triplet  
 4) doublet of triplets
11. Identify the  $\text{C}_4\text{H}_9\text{Cl}$  isomer given the following proton NMR data:

doublet  $\delta$  1.04 (6H)  
 multiplet  $\delta$  1.95 (1H)  
 doublet  $\delta$  3.35 (2H)

1)  $(\text{CH}_3)_3\text{CCl}$     2)  $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{Cl}$     3)  $\text{CH}_3\text{CH}_2\underset{\text{Cl}}{\text{CH}}\text{CH}_3$     4)  $(\text{CH}_3)_2\text{CHCH}_2\text{Cl}$

1) 1                      2) 2                      3) 3                      4) 4

12. In infrared spectroscopy, absorption of electromagnetic radiation results in transitions between \_\_\_\_\_ energy levels.

1) vibrational    2) electronic    3) rotational    4) nuclear