

**Chemistry 210 NMR Quiz**  
**October 29, 2009**

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

This quiz is due back on November 4, 2009 during lab.

Answers:

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

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

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

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

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

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

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

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

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

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

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

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

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

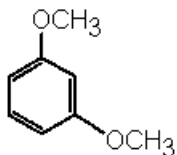
14. \_\_\_\_\_

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

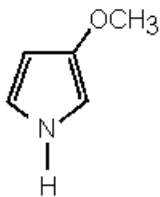
*NOTE: Sometimes the Greek lettering does not always convert over to a pdf document, so I inserted the names for the appropriate Greek letters throughout the quiz. Good luck.*

October 29, 2009

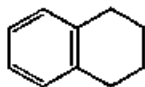
1. What does the integral trace on an NMR spectrum indicate?
  - a. the total number of protons in the compound
  - b. the relative number of protons coupled to adjacent nuclei
  - c. the size of the magnetic field
  - d. the absolute number of protons in each magnetic environment
  - e. the relative number of protons in each magnetic environment
2. Why do the protons on an aromatic ring occur downfield in an NMR spectrum?
  - a. a shielding effect by the  $\sigma$ -electrons
  - b. a deshielding effect by the  $\sigma$ -electrons
  - c. ring current shielding
  - d. a deshielding effect by the  $\pi$ -electrons
  - e. an anisotropy of the  $\pi$ -electrons
3. What does the  $(n + 1)$  rule state?
  - a. a multiplet containing  $n$  peaks implied  $n + 1$  equivalent protons on the adjacent atom
  - b. a proton with  $n + 1$  equivalent neighbors will have its resonance split into  $n$  peaks.
  - c. for  $n$  protons in a compound the number of different chemical shifts will be  $n + 1$
  - d. spin-spin coupling between  $n$  protons can only occur through up to  $n + 1$  bonds
  - e. a proton with  $n$  equivalent neighbors will have its resonance split into  $n + 1$  peaks
4. What is the number of chemical shift equivalent groups of hydrogen atoms on this substance?
  - a. 3
  - b. 4
  - c. 2
  - d. 6
  - e. 5



5. What is the number of chemical shift equivalent groups of hydrogen atoms on this substance?
- a. 3
  - b. 2
  - c. 5
  - d. 4
  - e. 6



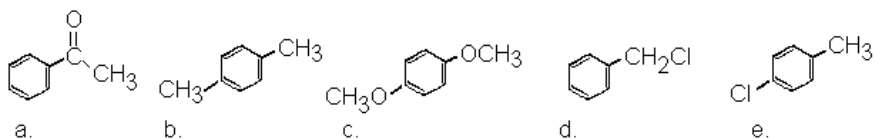
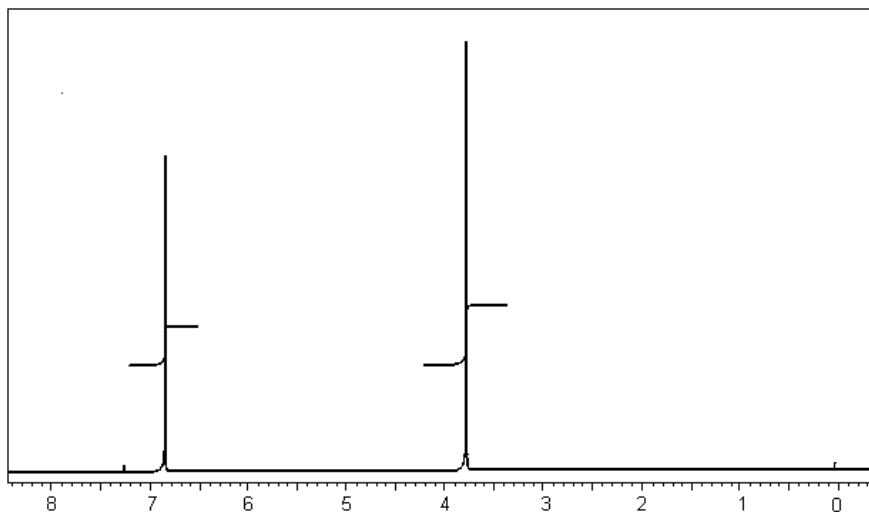
6. What is the number of chemical shift equivalent groups of hydrogen atoms on this substance?
- a. 2
  - b. 3
  - c. 6
  - d. 5
  - e. 4



7. The <sup>1</sup>H-NMR spectrum of 1-bromo-2,2-dimethyl propane ((CH<sub>3</sub>)<sub>3</sub>CCH<sub>2</sub>Br) contains which of these sets of resonances?
- a. singlet, quartet, triplet
  - b. quartet, triplet
  - c. singlet, doublet, quartet
  - d. triplet, decet
  - e. singlet, singlet
8. The <sup>1</sup>H-NMR spectrum of 1,3-dichloro-2-methyl propane ((ClCH<sub>2</sub>)<sub>2</sub>CHCH<sub>3</sub>) contains which of these sets of resonances?
- a. doublet, pentet, quartet
  - b. doublet, octet, doublet
  - c. octet, pentet, doublet
  - d. triplet, doublet, quartet
  - e. quartet, octet, doublet

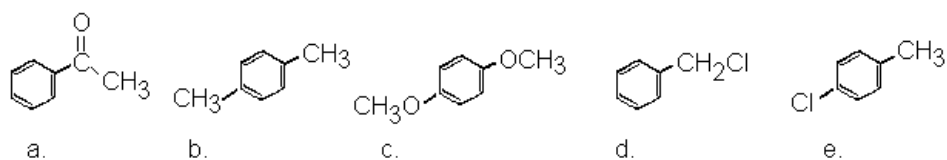
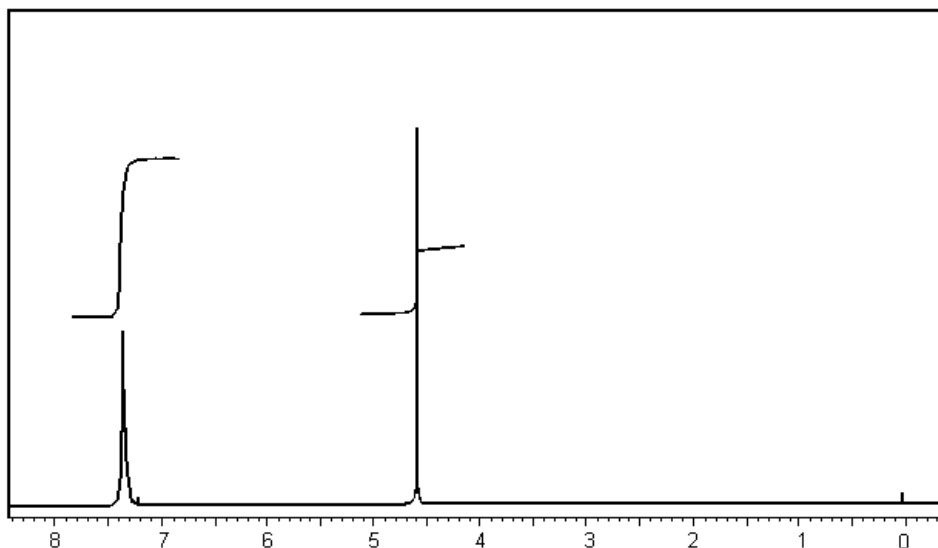
9. To which of these substances does the following  $^1\text{H-NMR}$  spectrum correspond?

- a. see graph a
- b. see graph b
- c. see graph c
- d. see graph d
- e. see graph e



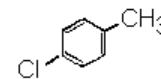
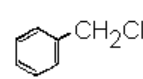
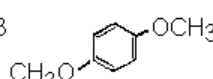
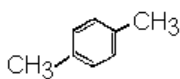
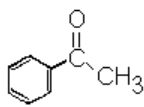
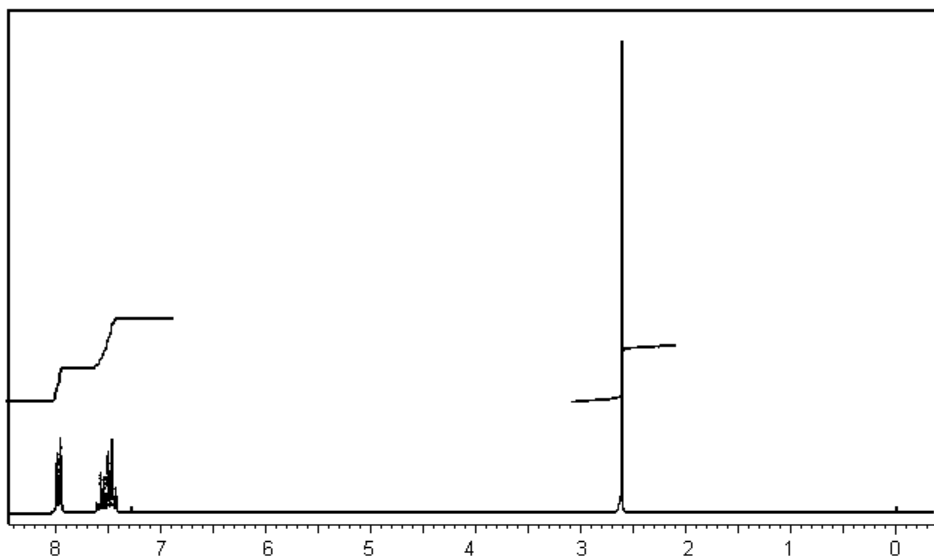
10. To which of these substances does the following  $^1\text{H-NMR}$  spectrum correspond?

- a. see graph a
- b. see graph b
- c. see graph c
- d. see graph d
- e. see graph e



11. To which of these substances does the following  $^1\text{H-NMR}$  spectrum correspond?

- a. see graph a
- b. see graph b
- c. see graph c
- d. see graph d
- e. see graph e



a.

b.

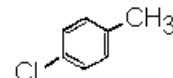
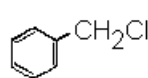
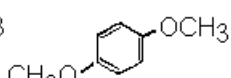
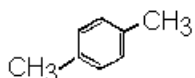
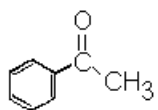
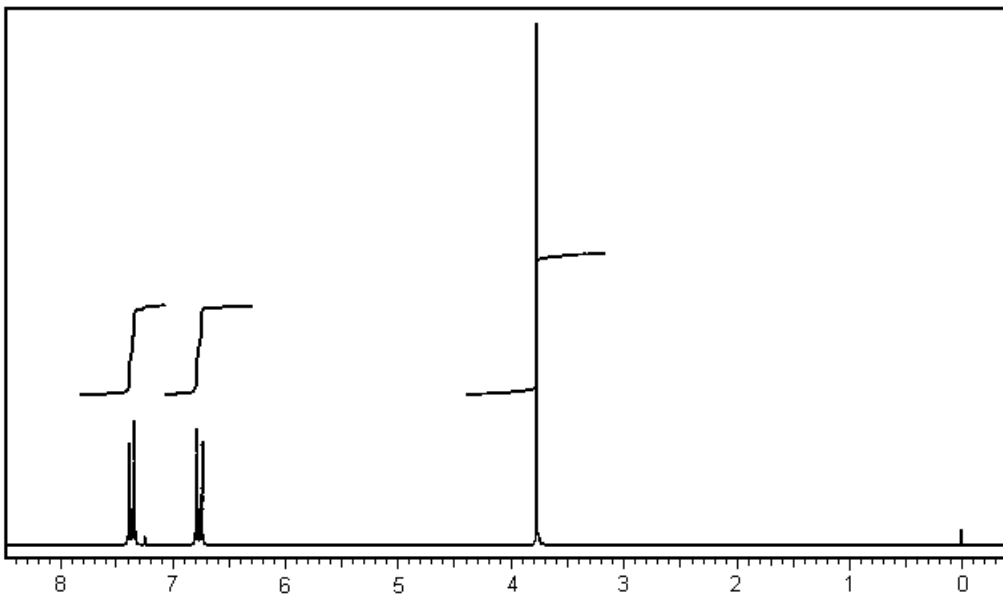
c.

d.

e.

12. To which of these substances does the following  $^1\text{H-NMR}$  spectrum correspond?

- a. see graph a
- b. see graph b
- c. see graph c
- d. see graph d
- e. see graph e



a.

b.

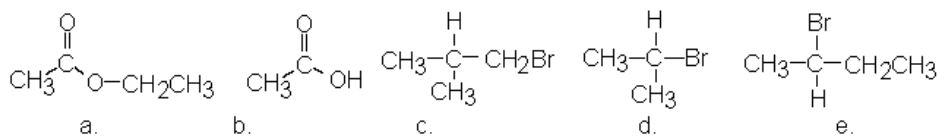
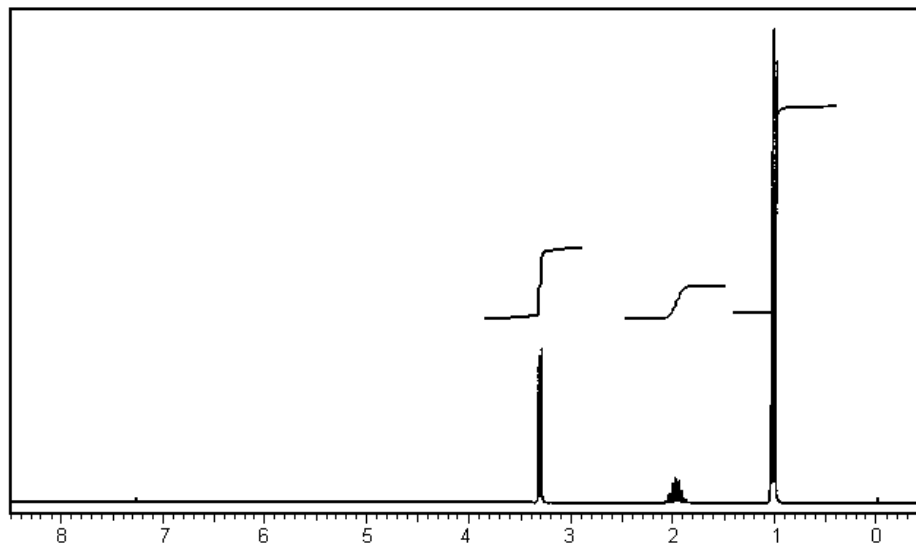
c.

d.

e.

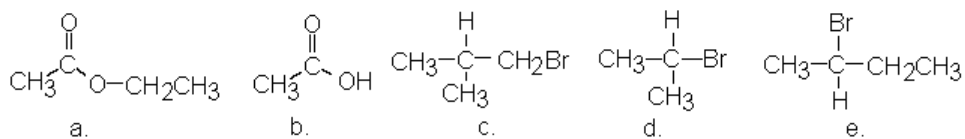
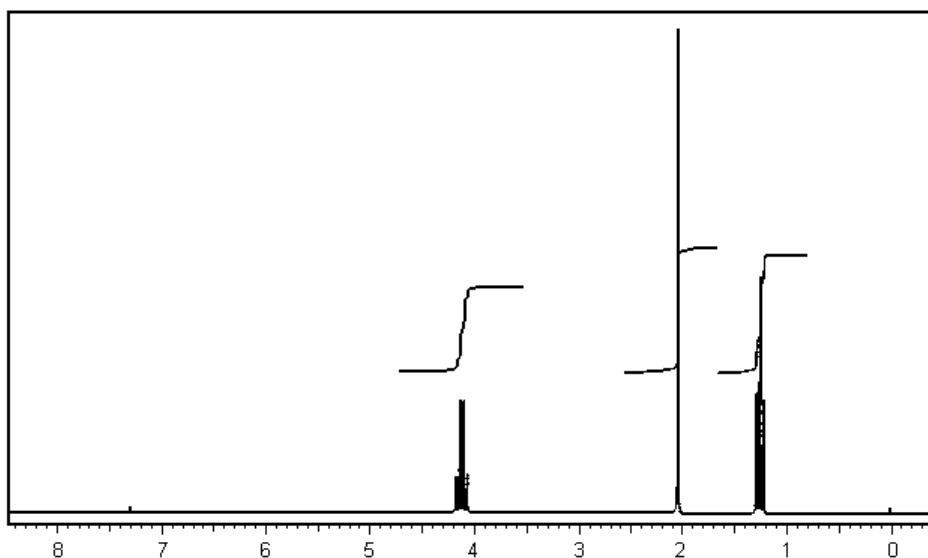
13. To which of these substances does the following  $^1\text{H-NMR}$  spectrum correspond?

- a. see graph a
- b. see graph b
- c. see graph c
- d. see graph d
- e. see graph e



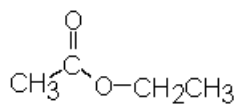
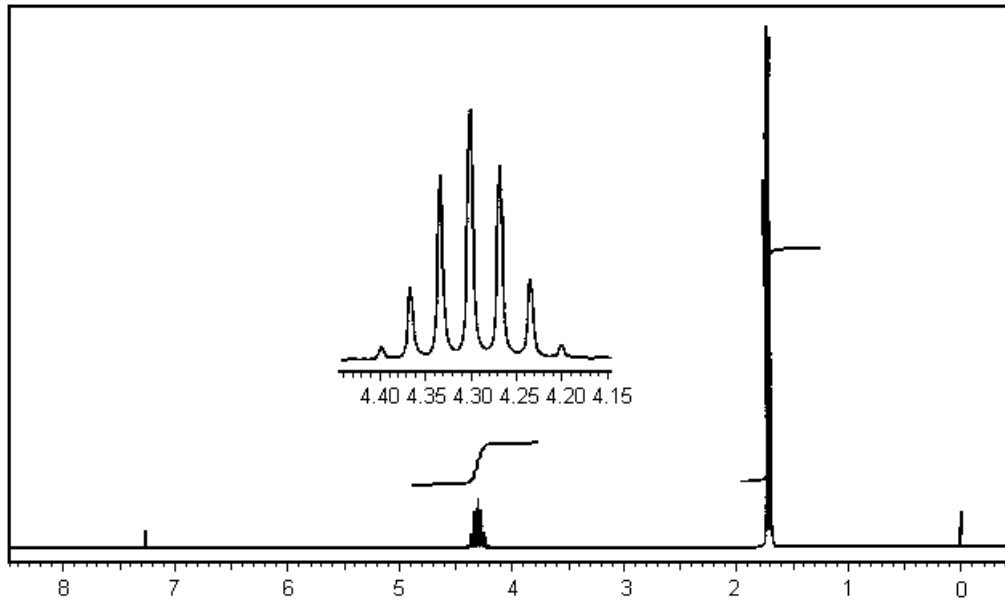
14. To which of these substances does the following  $^1\text{H-NMR}$  spectrum correspond?

- a. see graph a
- b. see graph b
- c. see graph c
- d. see graph d
- e. see graph e

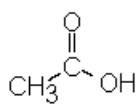


15. To which of these substances does the following  $^1\text{H-NMR}$  spectrum correspond?

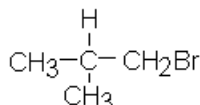
- a. see graph a
- b. see graph b
- c. see graph c
- d. see graph d
- e. see graph e



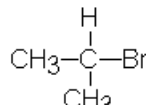
a.



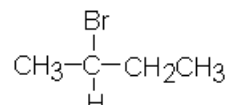
b.



c.



d.



e.

1. e
2. d
3. e
4. b
5. c
6. e
7. e
8. b
9. c
10. d
11. a
12. e
13. c
14. a
15. d