

**CEM 222**

**Exam 1**

**Dr. Berger**

**February 4, 2010**

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

Please write and sign the pledge: *"I am unaware of any aid given or received on this examination."*

This examination is worth 200 points and is expected to take you two hours. Please answer all questions as fully as possible. Partial credit will be given. This examination is closed book. You are expected to do your own work on this examination.

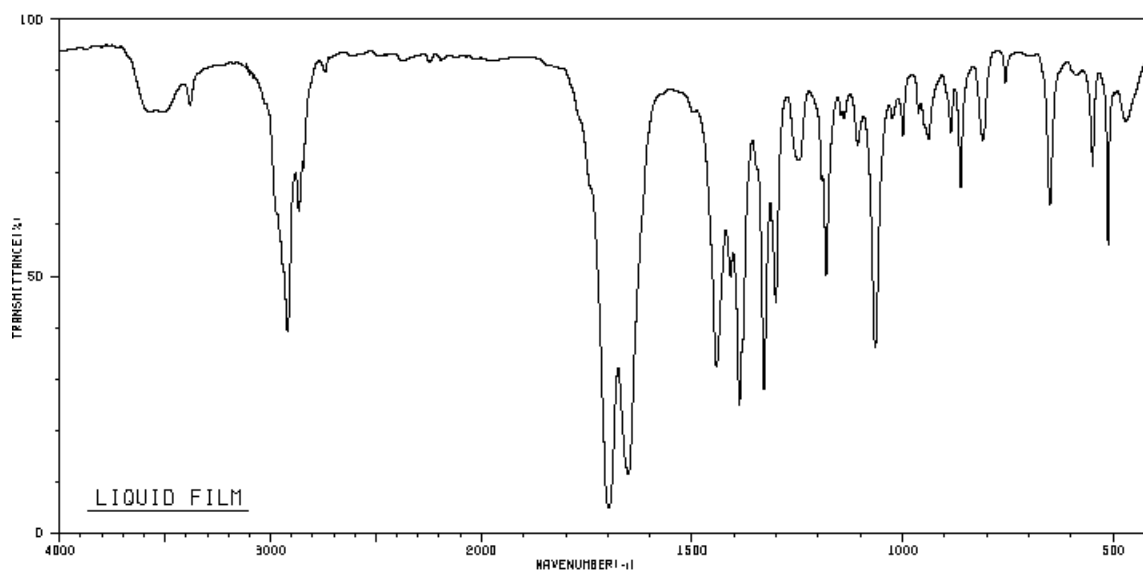
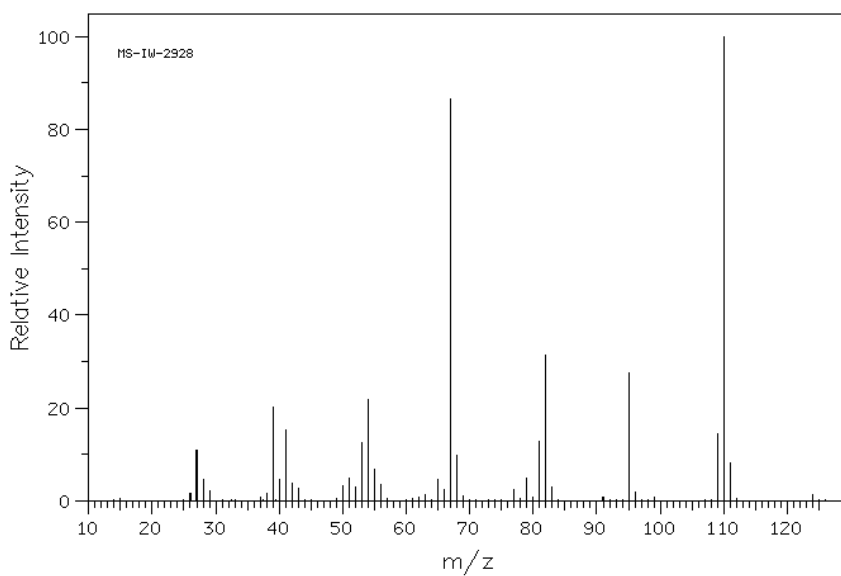
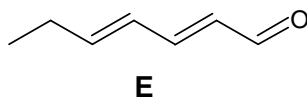
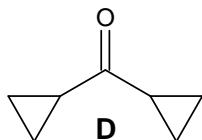
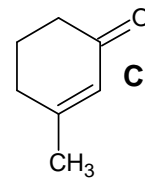
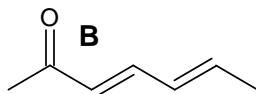
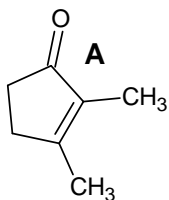
**It is NOT to your advantage to guess** on structural problems; wrong structural elements will be penalized.

All elemental analysis numbers are for carbon, hydrogen, oxygen analysis only.

Blank paper will be provided, and you may need it to completely answer some questions. You should intersperse answer pages with the pages of this examination before stapling the pages and handing them in. Be sure your name is on all pages turned in!

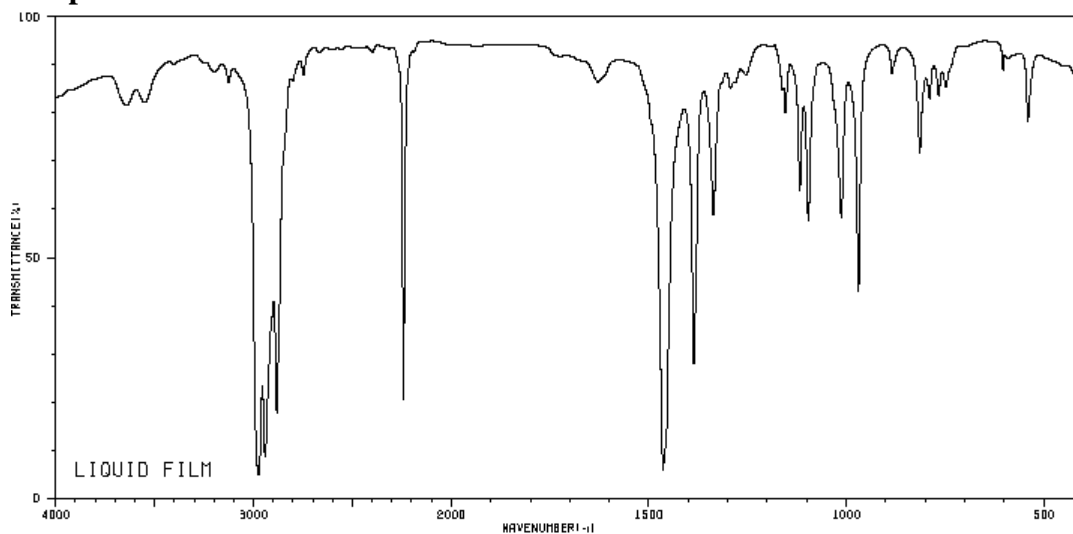
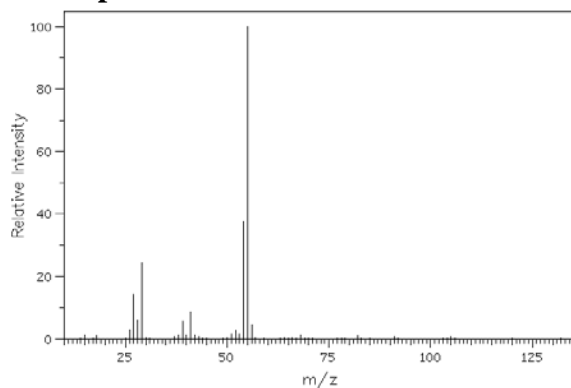
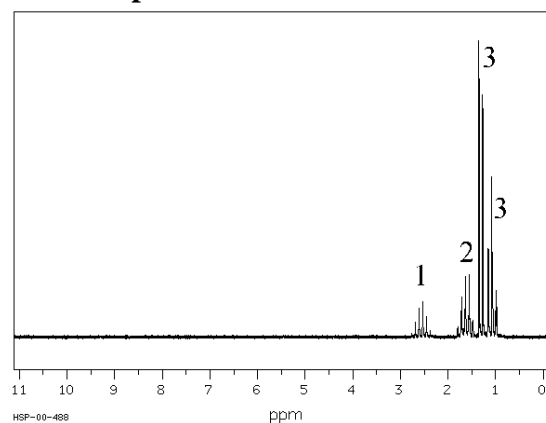
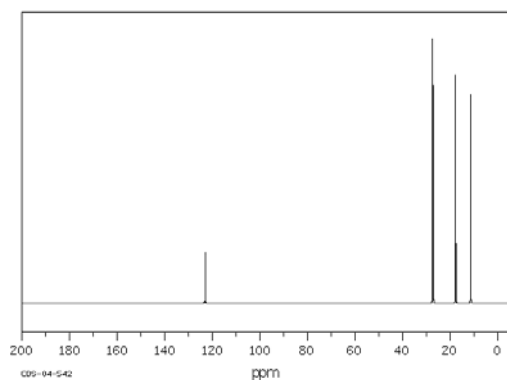


1. **For each** of the five isomeric structures below, explain briefly why it is consistent or inconsistent with the mass and IR spectra shown. (10 points each)





4. A certain compound, with elemental analysis 71.73% carbon and 11.26% hydrogen, has the spectral data shown below. What is the structure of the compound? (30 points)

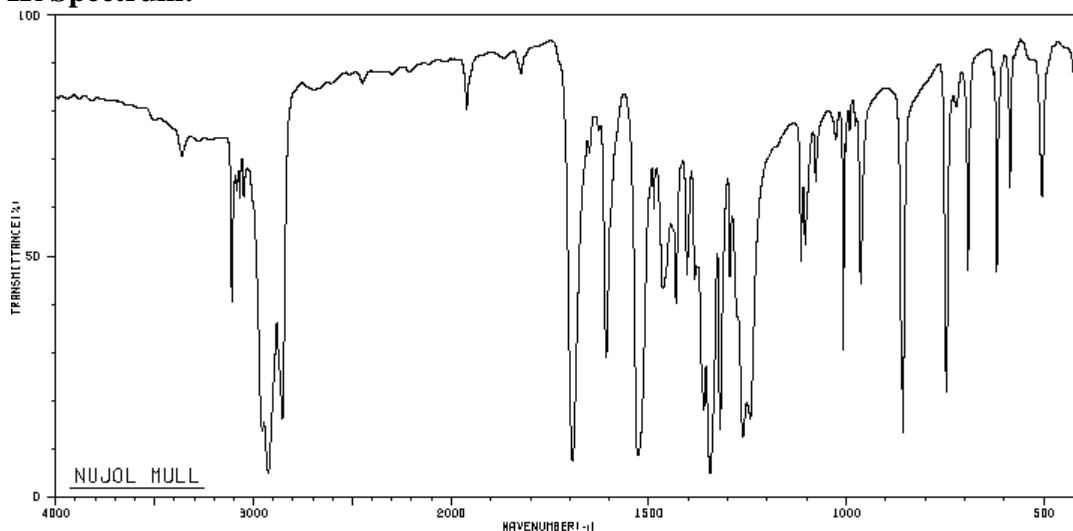
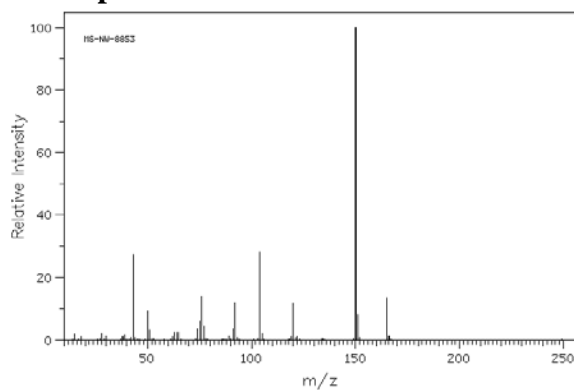
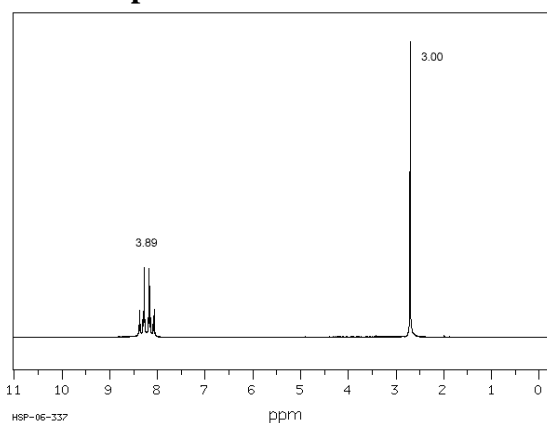
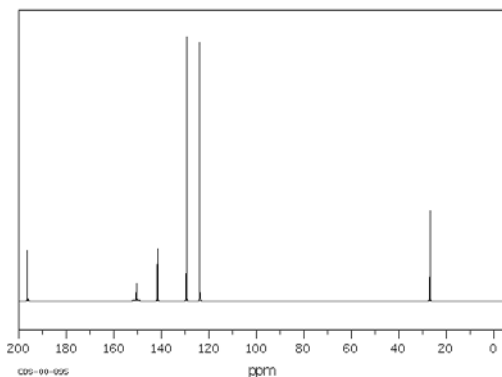
**IR Spectrum:****Mass spectrum:****<sup>1</sup>H NMR spectrum:****<sup>13</sup>C NMR spectrum:****DEPT spectral data:**

DEPT-45: 27.39, 27.13, 17.69, 11.40

DEPT-90: 27.13

DEPT-135: 27.39(-), 27.13(+), 17.69(+),  
11.40(+)

5. A certain compound, with molecular mass 165 and elemental analysis 58.56% carbon, 3.64% hydrogen and 28.07% oxygen, has the spectral data shown below. What is the structure of the compound? (30 points)

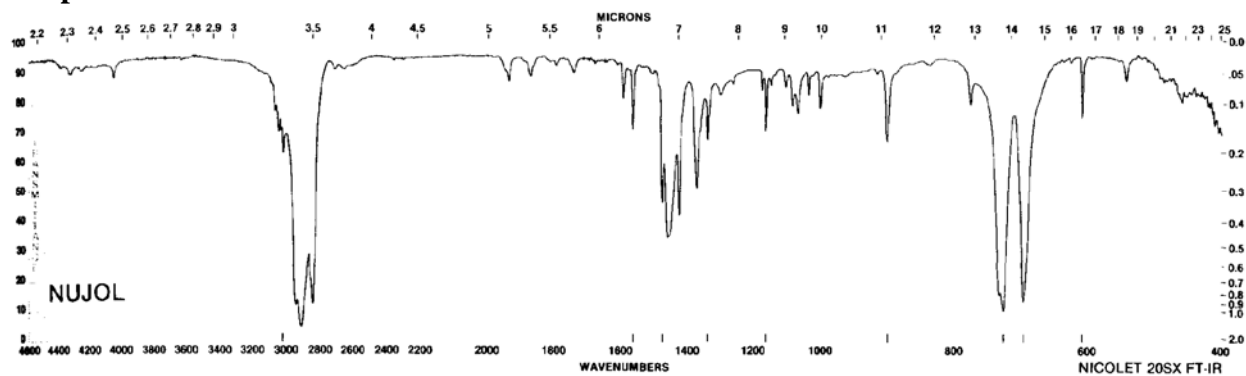
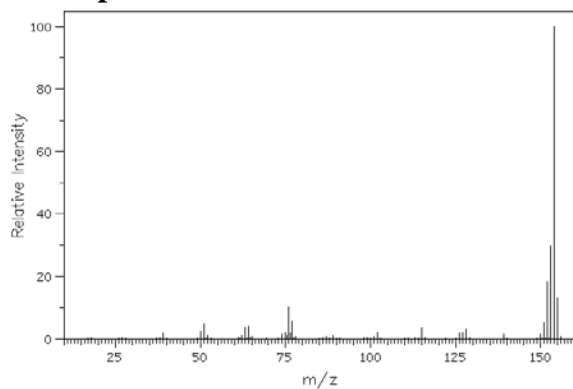
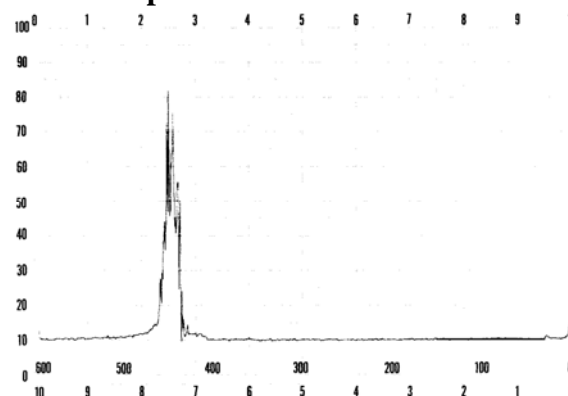
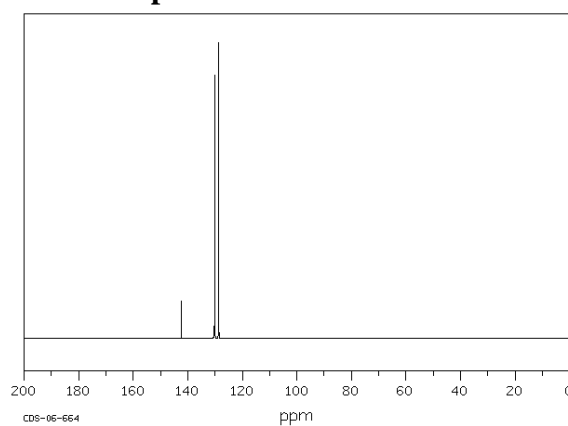
**IR Spectrum:****Mass spectrum:****<sup>1</sup>H NMR spectrum:****<sup>13</sup>C NMR spectrum:****DEPT spectral data:**

DEPT-45: 129.39, 123.86, 26.91

DEPT-90: 129.39, 123.86

DEPT-135: 129.39(+), 123.86(+), 26.91(+)

6. A certain compound, with elemental analysis 94.21% carbon and 5.79% hydrogen, has the spectral data shown below. What is the structure of the compound? (30 points)

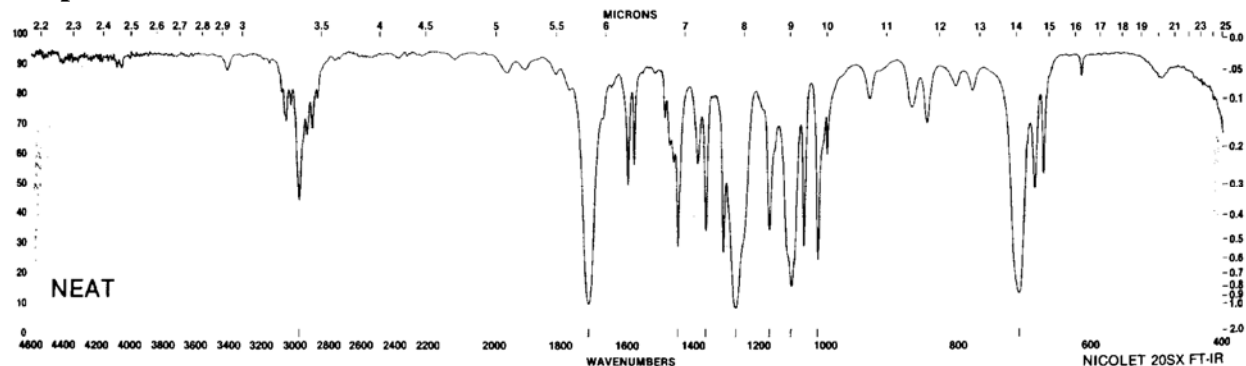
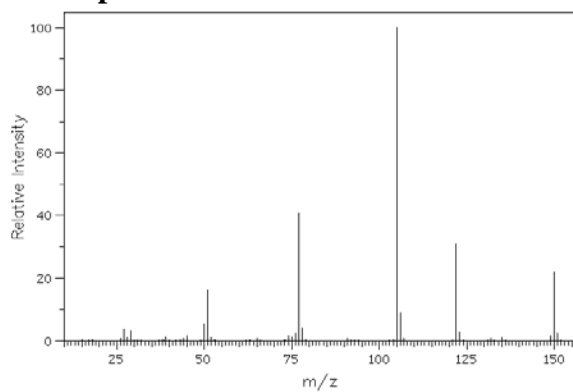
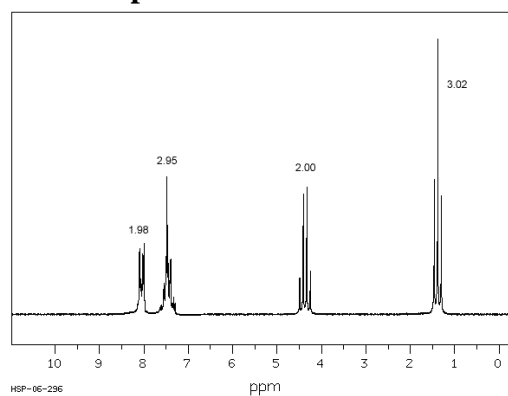
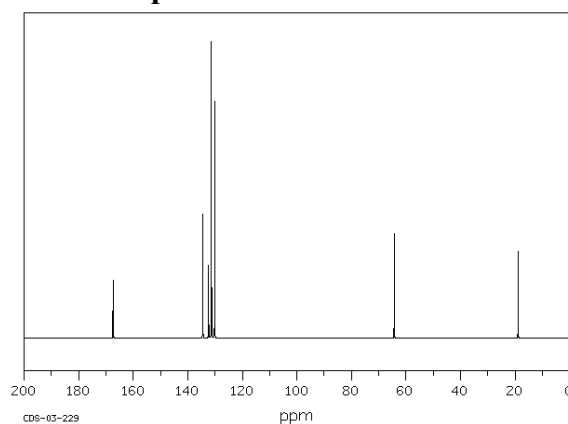
**IR Spectrum:****Mass spectrum:****<sup>1</sup>H NMR spectrum:****<sup>13</sup>C NMR spectrum:****DEPT spectral data:**

DEPT-45: 128.35, 126.85, 126.78

DEPT-90: 128.35, 126.85, 126.78

DEPT-135: 128.35(+), 126.85(+), 126.78(+)

7. A certain compound, with elemental analysis 72.30% carbon, 5.55% hydrogen and 22.15% oxygen, has the spectral data shown below. What is the structure of the compound? (30 points)

**IR Spectrum:****Mass spectrum:** **$^1\text{H}$  NMR spectrum:** **$^{13}\text{C}$  NMR spectrum:****DEPT spectral data:**

DEPT-45: 132.80, 129.57, 128.34, 60.90, 14.33

DEPT-90: 132.80, 129.57, 128.34

DEPT-135: 132.80(+), 129.57(+), 128.34(+), 60.90(-), 14.33(+)