

CHEM/BCMB 8190 10/09/02
Midterm Answers

Part I (5pts each)

- | | |
|--|----------------------------------|
| 1. 111 negative | 6. ~ 10,250 Hz |
| 2. +100 | 7. 2.8 to $i-1$ 4.42 to $i-3$ |
| 3. $-I_{1y}I_{2x}S_z$ | 8. CS, LB, het J |
| 4. 5 Hz weights $\frac{5}{N}$ Content of FID properly | 9. 16:1 |
| 5. $HN \leftrightarrow CH_3$, | 10. HSQC |

Part II

a) $M_y \propto \text{Tr}([I_y] \cdot [I_y])$ (15pts)

$$= \frac{1}{2} i \text{Tr} \begin{bmatrix} 0 & 0 & -1 & 0 \\ 0 & 0 & 0 & -1 \\ 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \end{bmatrix} \begin{bmatrix} .1 & .1i & (.6-2i) & (-.5+.4i) \\ -.1i & .2 & (-.2+.5i) & (.1-.3i) \\ (.6+.2i) & (-.2-.5i) & .1 & -.4 \\ (-.5-.4i) & (.1+.3i) & -.4 & .3 \end{bmatrix}$$

$$= (-.6 - .2i - .1-.3i + .6-2i + .1-.3i) \frac{1}{2} i$$

$$= \frac{1}{2}$$

b) $0.3 + 0.1 = 0.4$ (10 pts)

Part III

$$I_{1z} \xrightarrow{90^\circ_x} -I_{1y} \xrightarrow{2I_{1x}I_{2z} (\theta = \pi/2)} 2I_{1x}I_{2z}$$

$$\xrightarrow{90^\circ_x} -2I_{1x}I_{2y} \xrightarrow{90^\circ_y} +2I_{1z}I_{2y}$$

$$I_{3z} \xrightarrow{90^\circ_x} -I_{3y} \xrightarrow{2I_{1z}I_{2z} (\theta = \pi/2)} -I_{3y}$$

$$\xrightarrow{90^\circ_x} -I_{3z} \xrightarrow{90^\circ_y} -I_{3x}$$

magnetization starting on 1 ends on 2.

magnetization of spin 3 is observable at end of seq.

(phase cycling is required to remove spin 3 mag.)