Date received: _____ ***Two training sessions in groups of 4-5 will be scheduled***
Date trained : _____ ***AFTER satisfactory completion of this quiz.***

Please return completed quizzes to Letitia Yao in 196B Kolthoff or Box D-6.

**APPLICATION FOR NMR TRAINING (Bruker instruments)**

NAME_____ ADVISOR_____

DATE _____ EMAIL_____

NMR LOGIN _____ BUDGET NO. _____

TIMES AVAILABLE _____

Circle one: undergraduate graduate post-doc faculty visiting scholar

*All users must demonstrate competence on entry level NMR **before** being trained on the hands-on instruments.*
Answers are readily found in the instruction manuals on **http://nmr.chem.umn.edu** or other places on the internet.

1a. If you have you ever used an NMR spectrometer by yourself, please check the manufacturer or list the specific model if known, e.g., Varian Inova or Bruker Avance II:
Varian/Agilent_____ Bruker_____ JEOL_____

1b. At what institution(s) did you use these instruments? _____

2. Which magnets in the Chemistry NMR lab are shielded?

3. What precautions should you take if a magnet is *not* shielded?

4. What is a cryoprobe? Which instrument has one?

5. What quality of NMR tubes should you use on the 500s?

6. What is the purpose of the sample gauge?

7. What is the optimum solvent height for NMR samples:
on the Varian instruments?_____ on the Bruker instruments? _____

8. What is the consequence of using a sample height/volume that is too short/small?

9. How should you dry an NMR tube?

10. On a 500 MHz spectrometer,
$^{1}$H nuclei resonate at _____MHz
$^{13}$C nuclei resonate at _____MHz
$^{19}$F nuclei resonate at _____MHz

11. Define the following acronyms:

NMR

FID

PFG

12. What type of information do these experiments typically provide?

DEPT

COSY

NOE

HETCOR

HMQC

HSQC

HMBC

13. Why should you run an HMQC or HSQC instead of a HETCOR or a 1D carbon spectrum?

14. What is the difference between a DEPT90 and a DEPT135?

15. What nuclei can you run on a routine basis on each of the following instruments?

| | |
|---|---|
| VI-300: | VI-500: |
| AM-400: | AV-500: |
| AX-400: | HD-500: |

16. What is the temperature range of the probe on each of the following instruments?

| | |
|---|---|
| VI-300: | VI-500: |
| AM-400: | AV-500: |
| AX-400: | HD-500: |

17. What should you do if you break an NMR sample *outside* a magnet?

18. What should you do if you break an NMR sample *inside* a magnet?

19. True or False. You never have to spin a sample to run an experiment.

20. What is the purpose of spinning?

21. What is the purpose of the lock? To find the lock, what parameter are you adjusting?

22. What nucleus do we normally use for "locking"? Why?

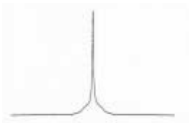
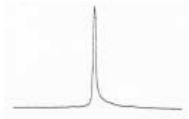
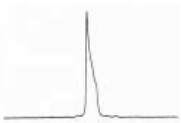
23. If the lock level goes off scale while shimming, what should you do?

24. If you can't find the lock or the lock signal is very erratic, i.e., bouncing up and down, what are some common things to check?

25. What is the difference between lock power and lock gain?

26. What is the purpose of shimming? How can you tell if you are shimming well?

27. The 3 spectra below all have at least one shim incorrectly set. Which shim(s) should be adjusted for each spectrum to achieve a good lineshape?

28. What is the purpose of tuning?

29. What does "prosol" do?

30. Which mouse button controls the height of the peaks or integrations?

31. How do you expand a spectral region?

32. How do you look at a spectrum before it is completed?

33. How do you *manually* phase a spectrum?

34. Provide the parameter or command for the following on a Bruker instrument:

| | |
|---|---|
| Acquisition time | |
| Relaxation delay | |
| Pulse width | |
| Start acquisition | |
| Process data | |
| Spectral window | |
| Middle of spectral window | |
| Number of scans | |
| Dummy scans | |
| Automatic phase | |
| Process spectrum | |
| Number of increments in a 2D spectrum | |
| Receiver gain | |
| Load standard shims | |
| Increment to new experiment | |
| **In a 2D experiment, what parameter would you increase for better** | |
| signal-to-noise | |
| resolution | |

35. What do the following buttons do?

| | |
|---|---|
|  |  |
|  |  |
|  |  |
|  |  |

36. Why is it important to know the T1 relaxation time of your molecule?

37. What is a 90 degree pulse?

38. You have collected 4 scans on a particular sample and would like to double the signal-to-noise. How many scans should you collect?

39. You acquire a quick 16-scan $^{1}$H spectrum with sufficient signal-to-noise, but your integral values don't make sense. What acquisition parameter(s) can you adjust to acquire data that give you better integrals?

40. How long did it take you to complete this quiz?