

**B.Sc. Semester-VI
Paper CC-XIV
Organic Chemistry-V**



III. Nuclear Magnetic Resonance Spectroscopy

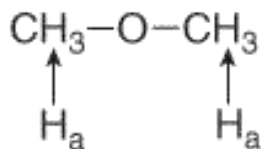


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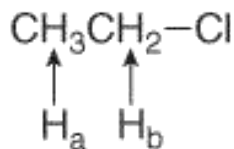
Nuclear Magnetic Resonance Spectroscopy

^1H NMR—Number of Signals

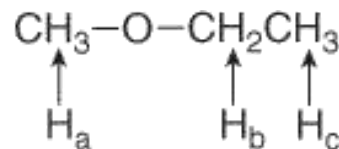
- The number of NMR signals equals the number of different types of protons in a compound.
- Protons in different environments give different NMR signals.
- Equivalent protons give the same NMR signal.



All equivalent H's
1 NMR signal

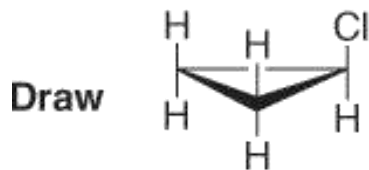


2 types of H's
2 NMR signals

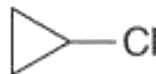


3 types of H's
3 NMR signals

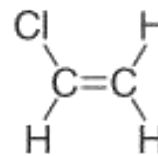
- To determine equivalent protons in cycloalkanes and alkenes, always draw all bonds to hydrogen.



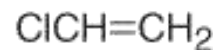
NOT



Draw

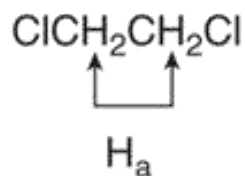


NOT

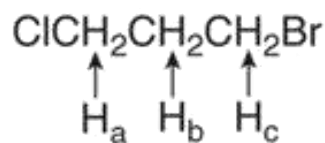


Nuclear Magnetic Resonance Spectroscopy

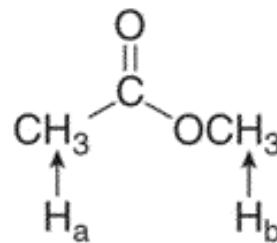
^1H NMR—Number of Signals



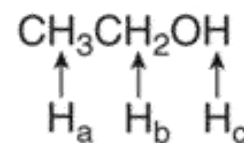
1 type of H
1 NMR signal



3 types of H's
3 NMR signals



2 types of H's
2 NMR signals

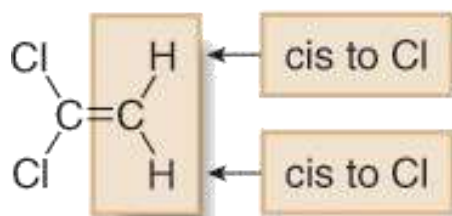


3 types of H's
3 NMR signals

Nuclear Magnetic Resonance Spectroscopy

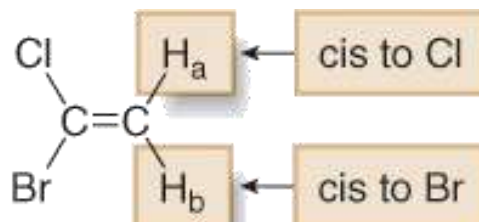
^1H NMR—Number of Signals

- In comparing two H atoms on a ring or double bond, two protons are equivalent only if they are cis (or trans) to the same groups.



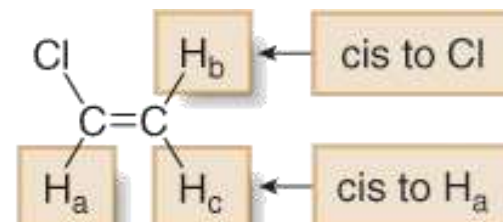
1,1-dichloroethylene

1 type of H
1 NMR signal



1-bromo-1-chloroethylene

2 types of H's
2 NMR signals



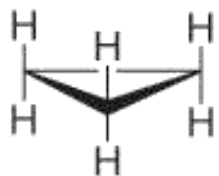
chloroethylene

3 types of H's
3 NMR signals

Nuclear Magnetic Resonance Spectroscopy

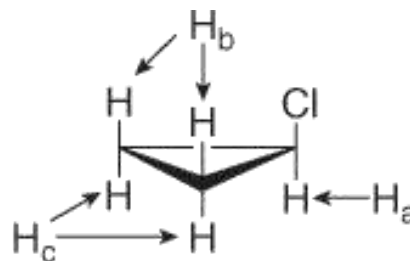
^1H NMR—Number of Signals

- Proton equivalency in cycloalkanes can be determined similarly.



cyclopropane

All H's are equivalent.
1 NMR signal



chlorocyclopropane

3 types of H's
3 NMR signals

Thank You



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