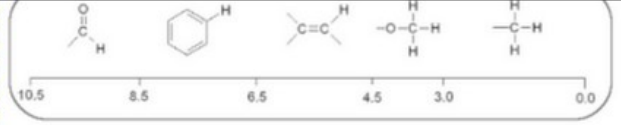
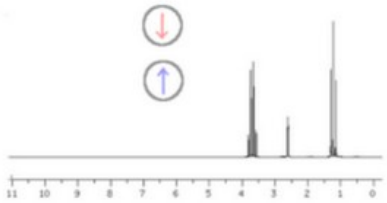
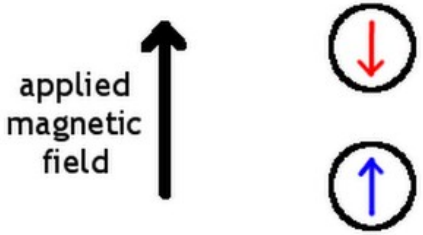


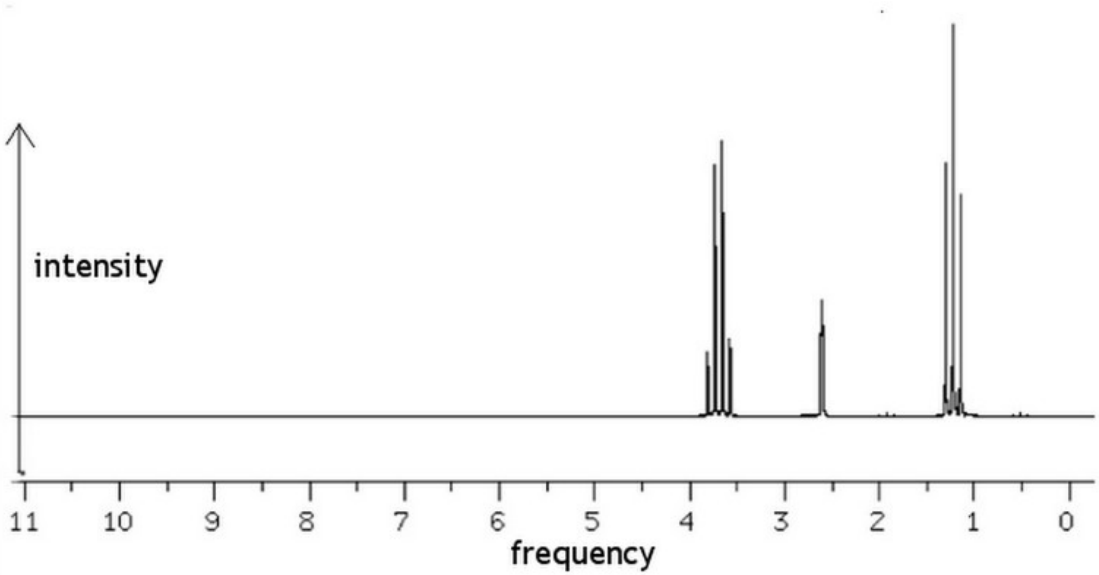
Proton Nuclear Magnetic Resonance

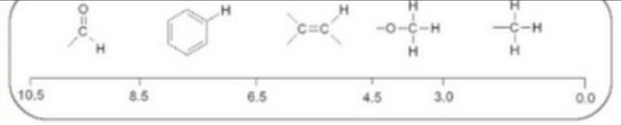
1. Introduction to H-NMR
2. Integration
3. Regions of spectrum
4. Coupling
5. Examples



1. Introduction to H-NMR



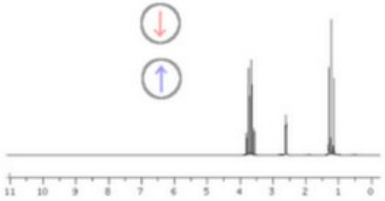


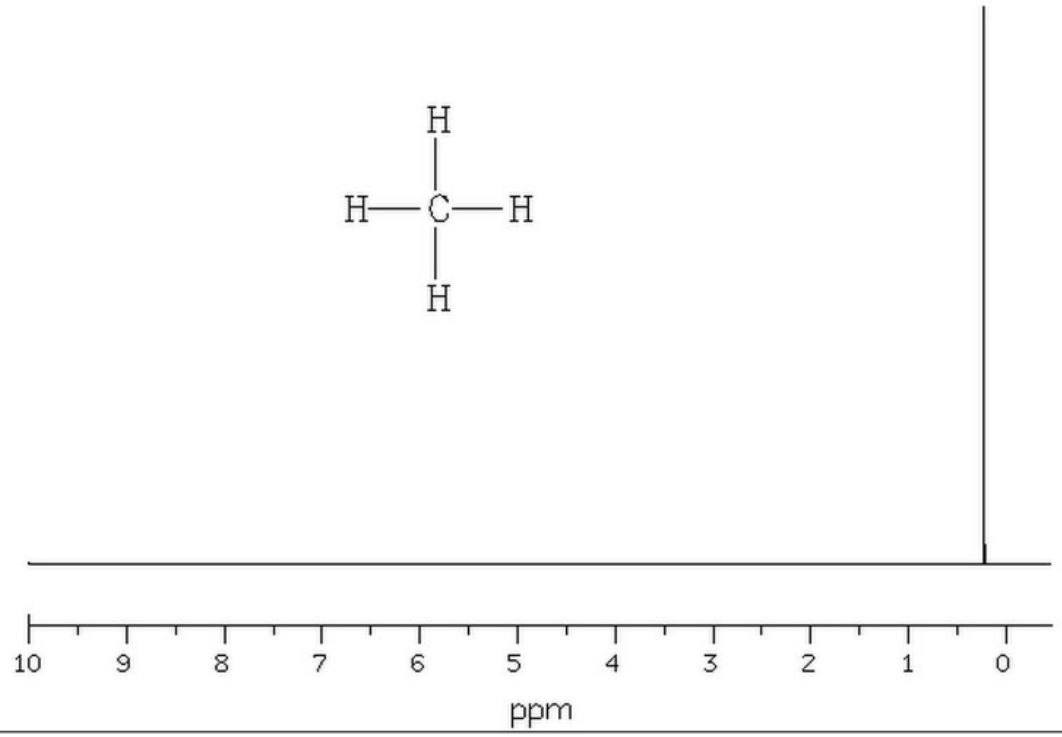


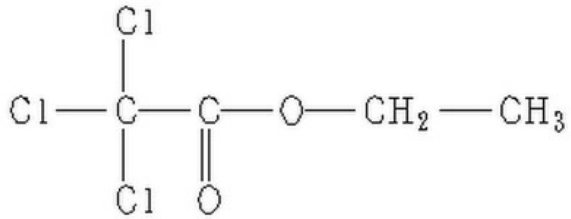
Proton Nuclear Magnetic Resonance

2. Integration

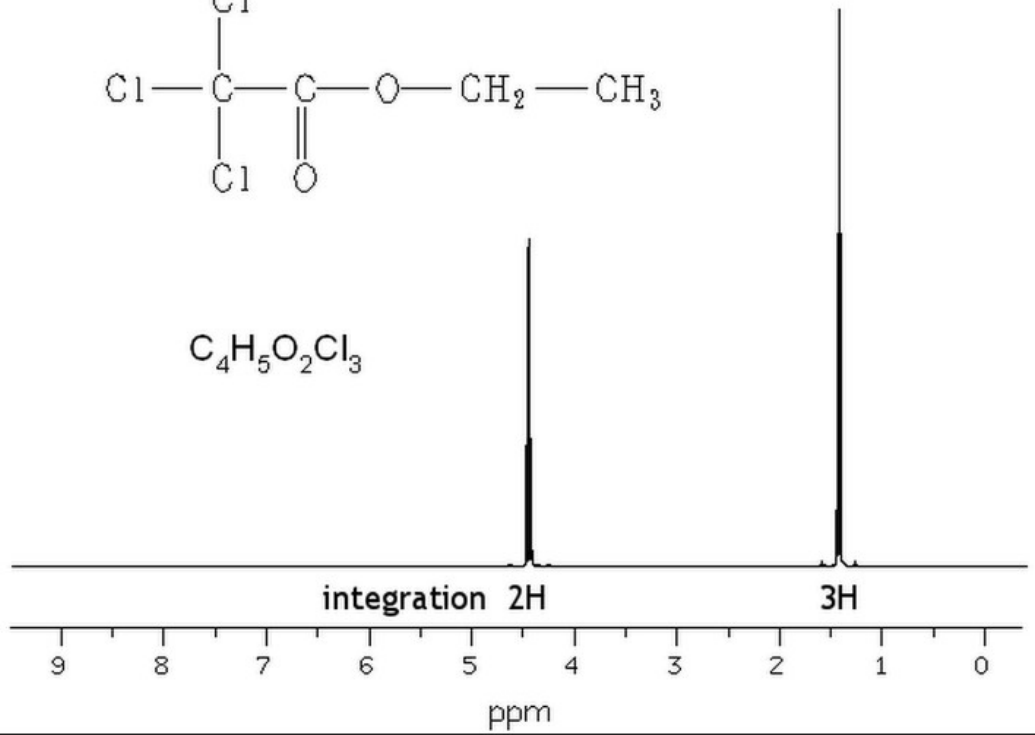
tells you how many protons each peak corresponds to



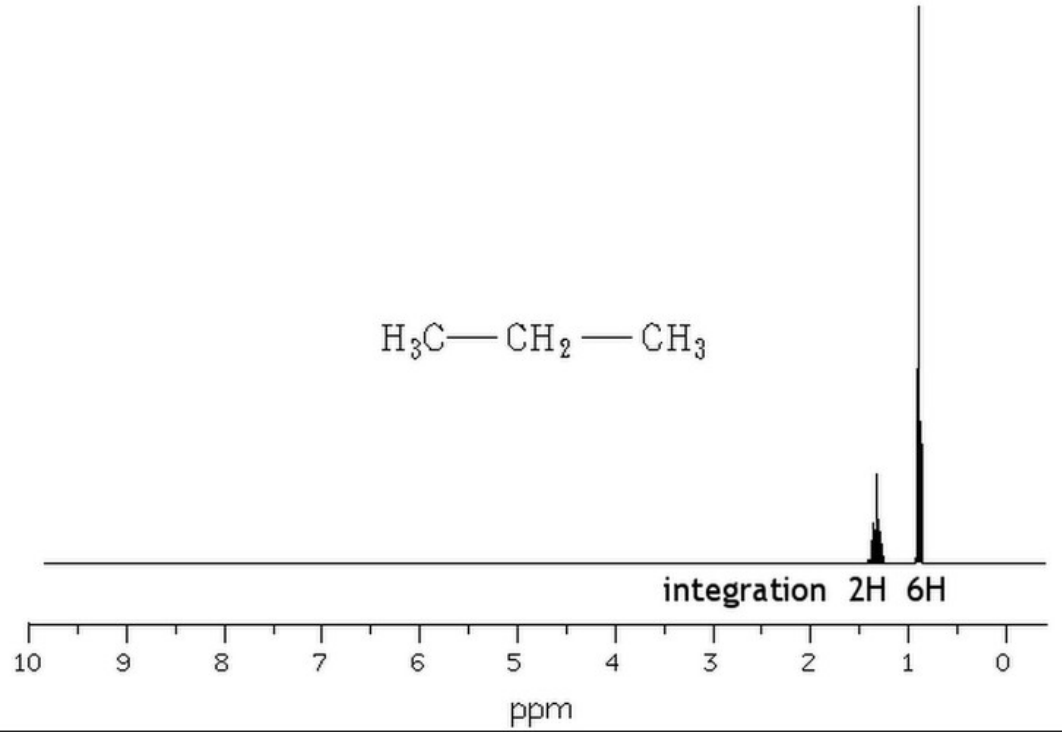


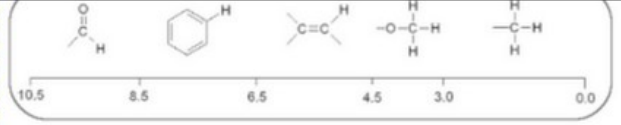


$C_4H_5O_2Cl_3$



$H_3C-CH_2-CH_3$

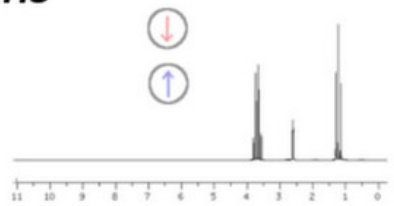


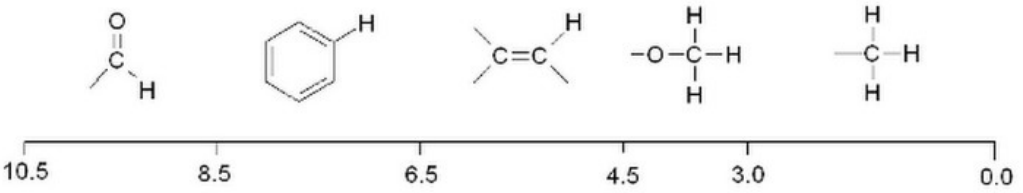


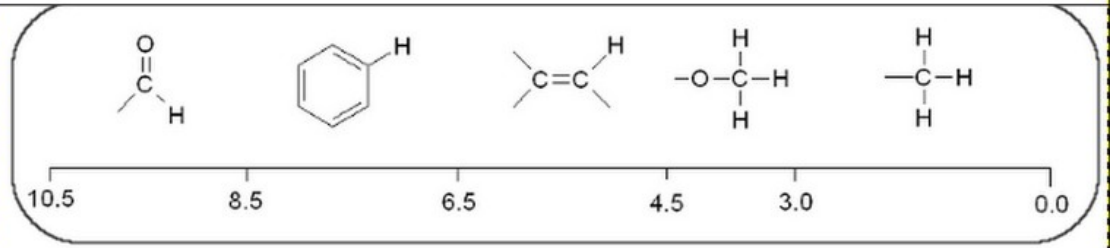
Proton Nuclear Magnetic Resonance

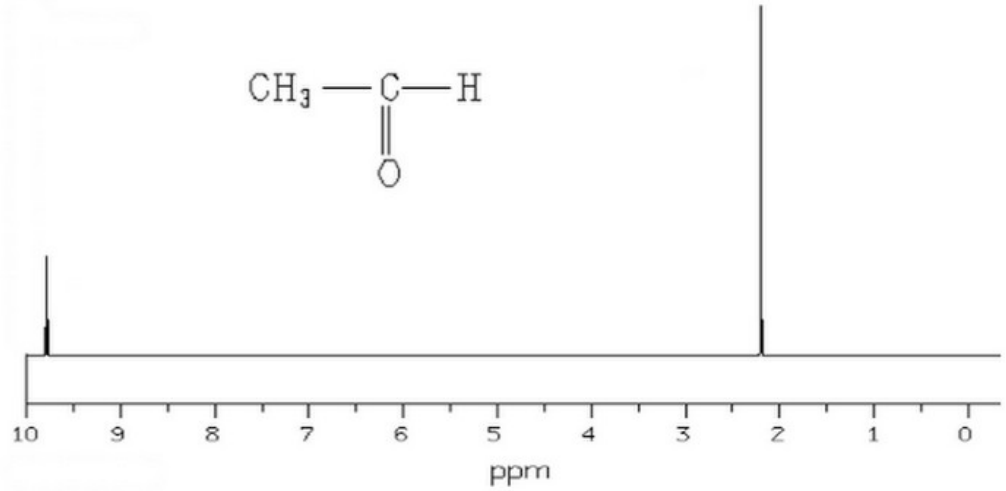
3. Regions of the spectrum

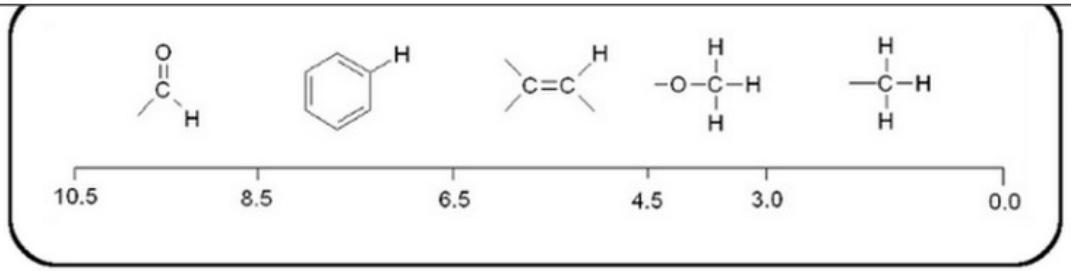
Chemical shift indicates the electron density around the hydrogen atoms

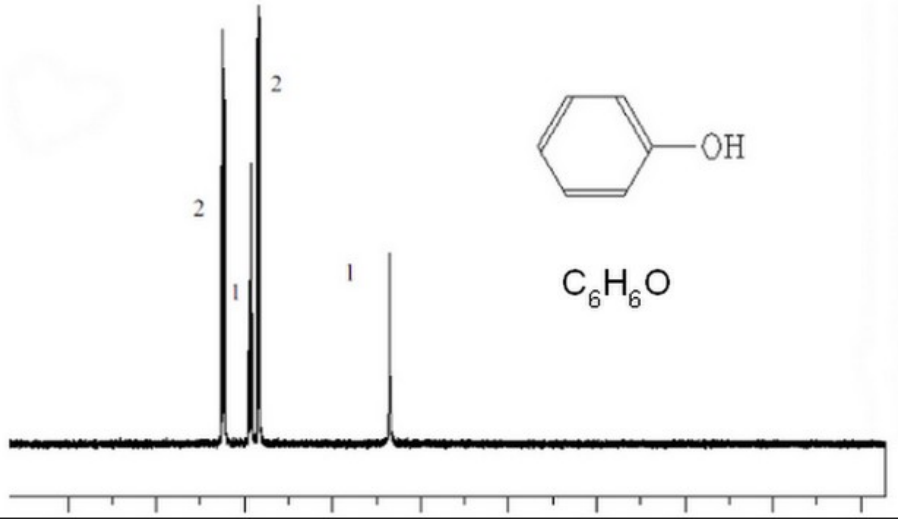


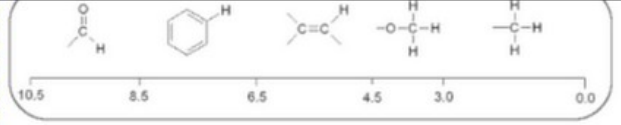








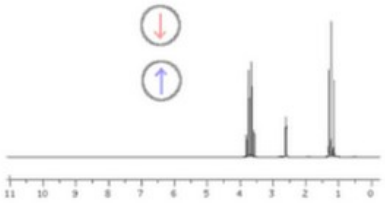


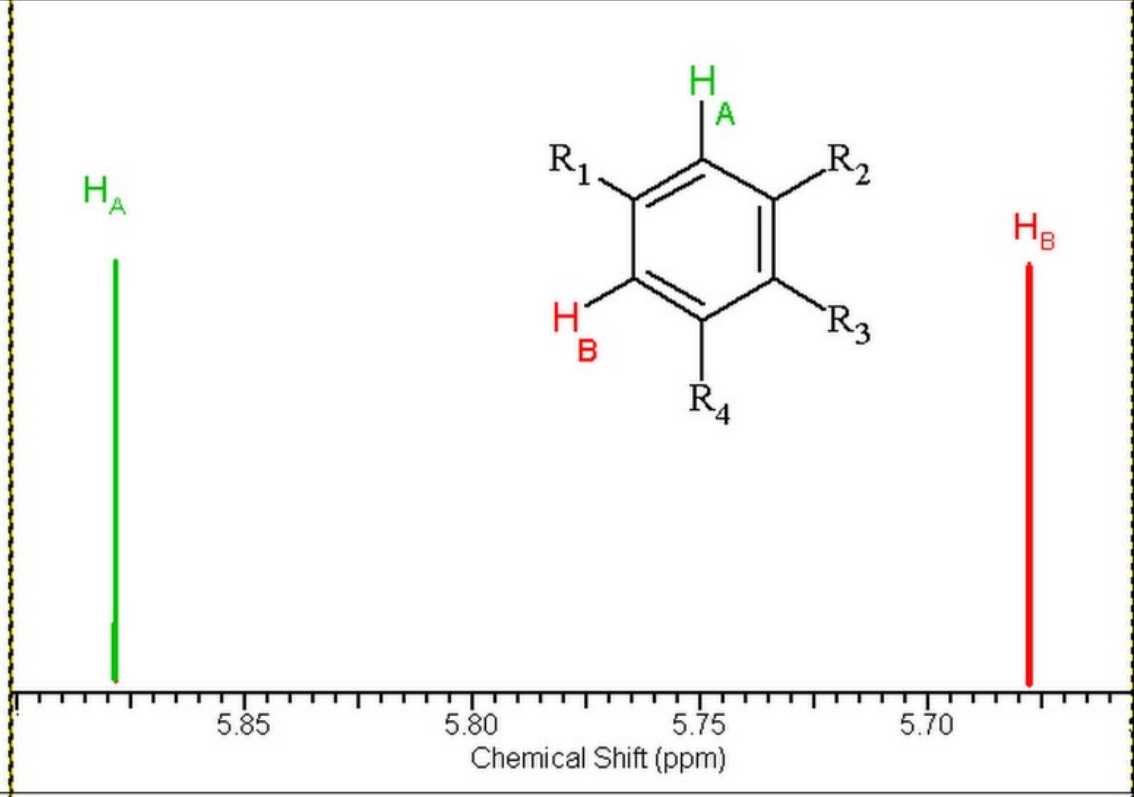


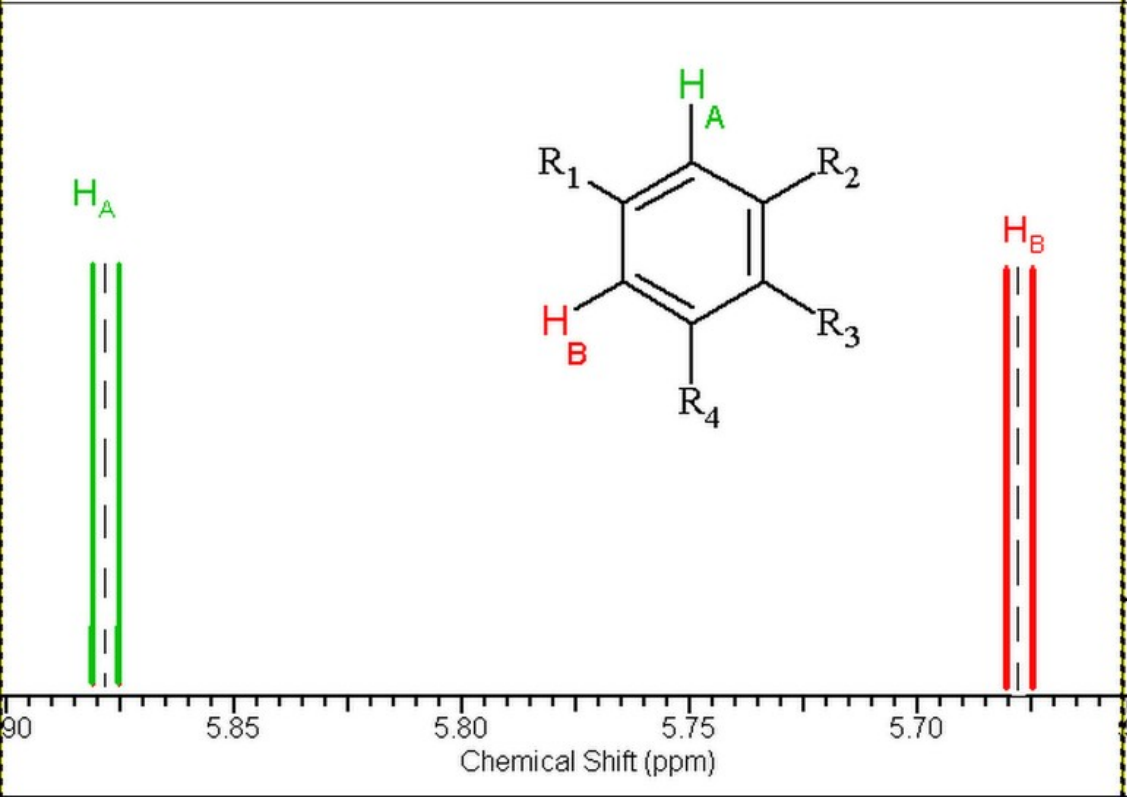
Proton Nuclear Magnetic Resonance

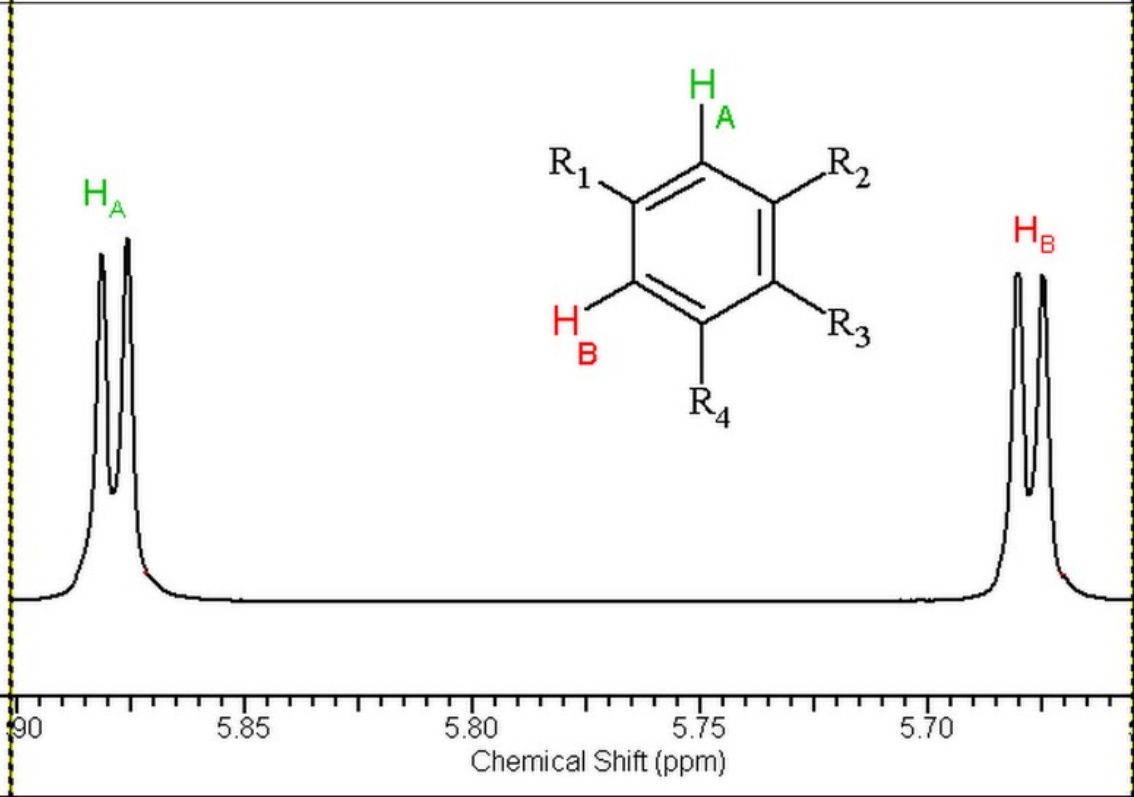
4. Coupling

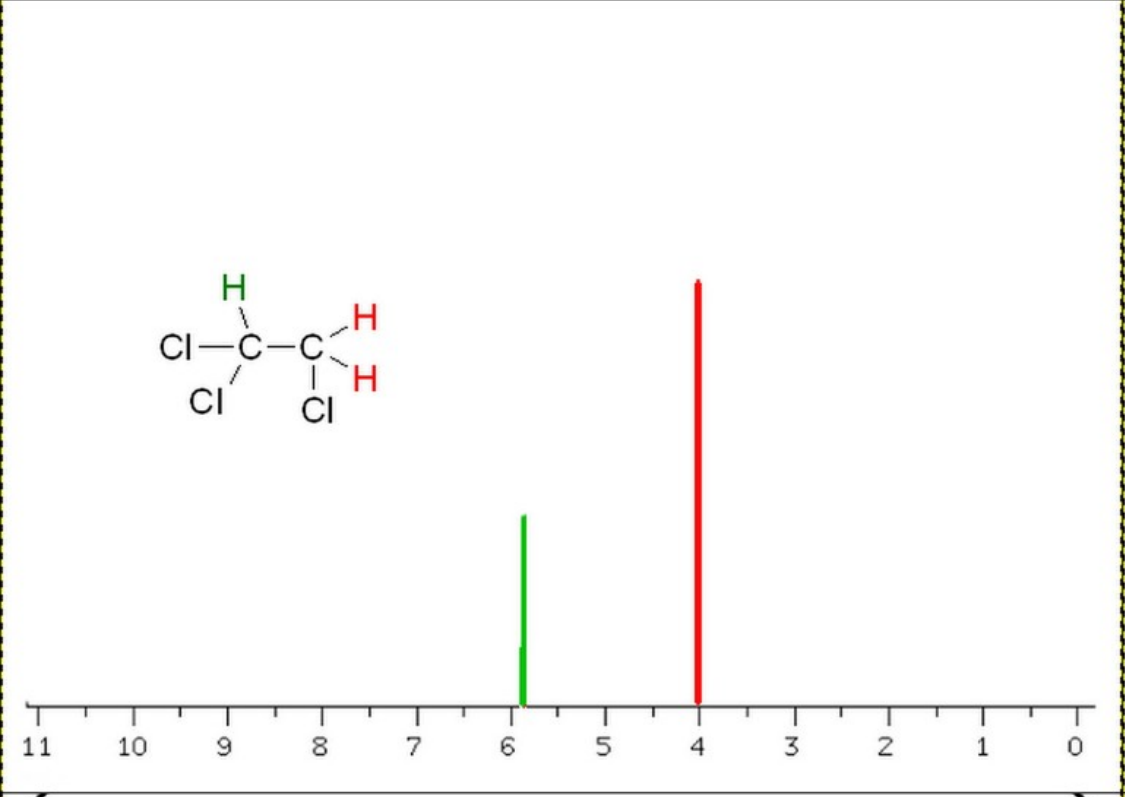
tells you about nearby hydrogen atoms







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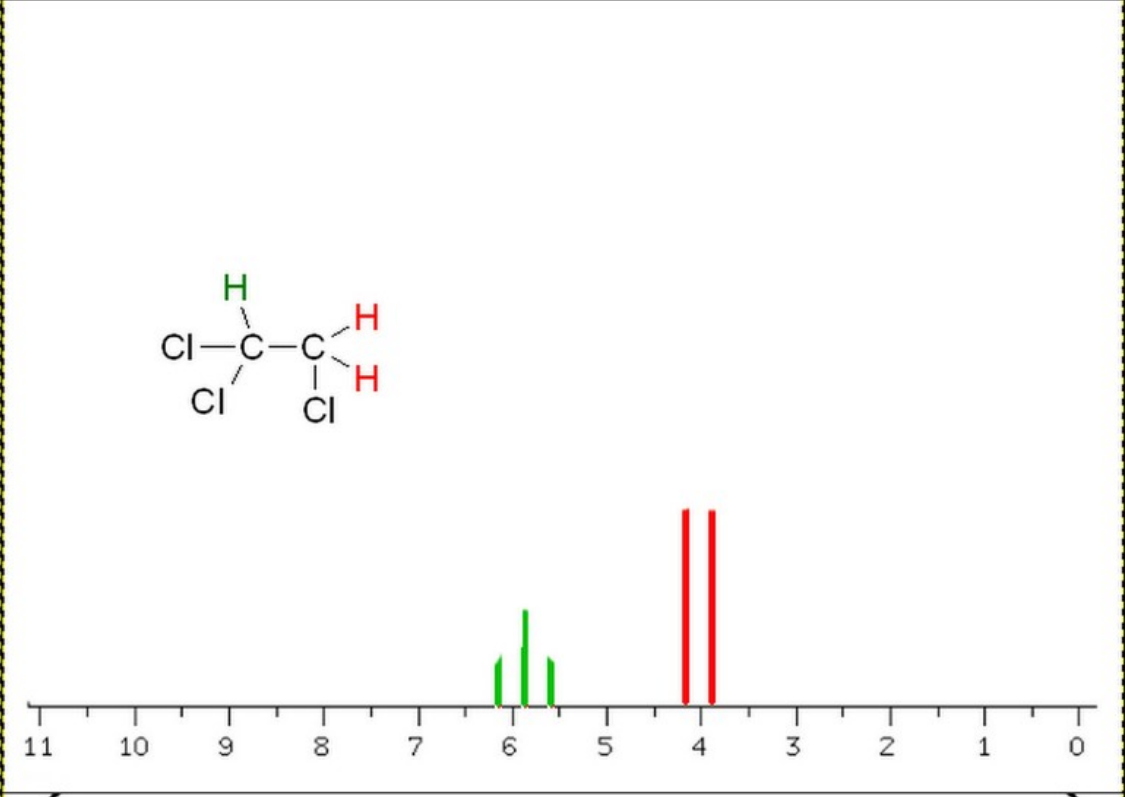
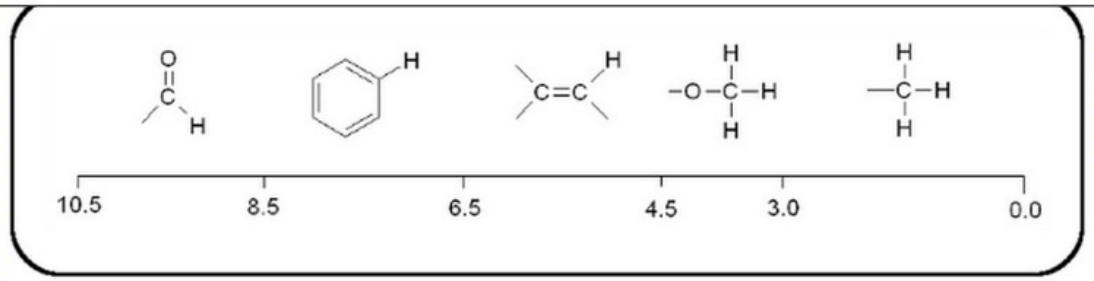
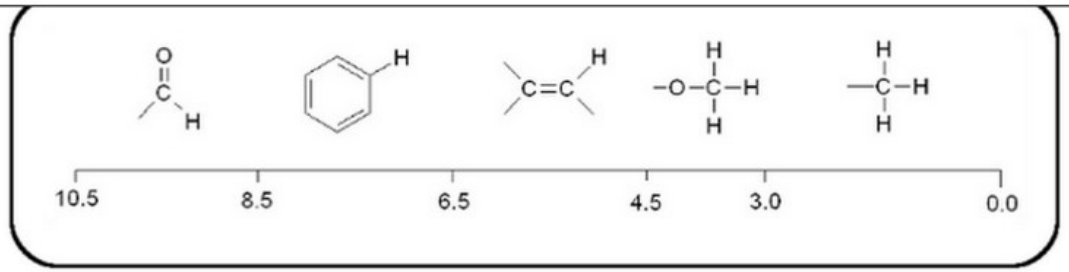
Cl
C
C
H
H
Cl
Cl
11 10 9 8 7 6 5 4 3 2 1 0


H
Cl
C
C
H
H
Cl
Cl
11 10 9 8 7 6 5 4 3 2 1 0


10.5 8.5 6.5 4.5 3.0 0.0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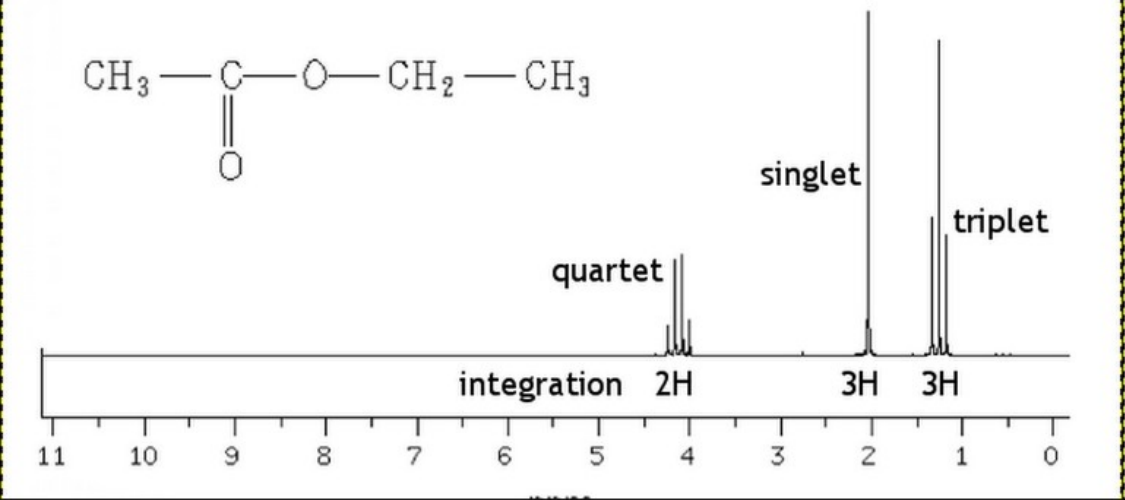
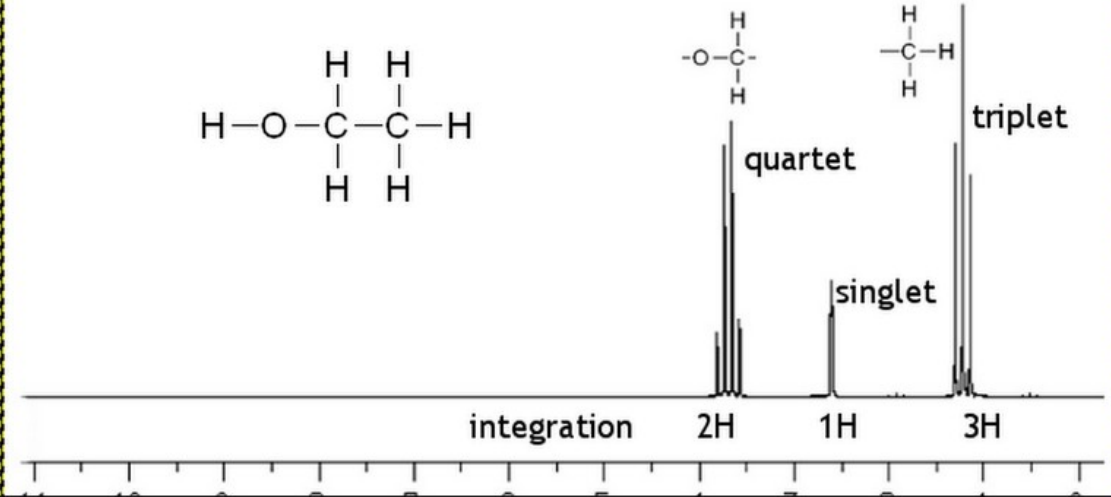

CH3 C O CH2 CH3
O
singlet
triplet
quartet
integration 2H 3H 3H
11 10 9 8 7 6 5 4 3 2 1 0


H O C C H
H H H H
quartet
triplet
singlet
integration 2H 1H 3H