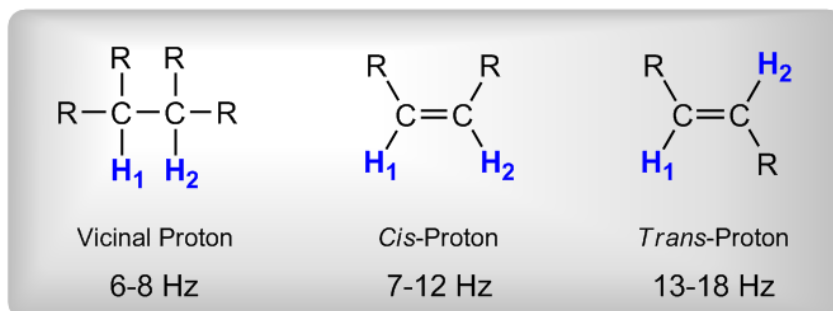**CONCEPT:** ¹H NMR – SPIN-SPLITTING WITH J-VALUES AND TREE DIAGRAMS

Coupling-Constants, also known as *J-values*, describe the amount of interaction that a proton will have on another.

Here are some examples of common coupling-constants (measured in Hz):

R R
| |
R—C—C—R
| |
H₁ H₂

Vicinal Proton

6-8 Hz

R   R
  \   /
   C=C
  /   \
H₁   H₂

Cis-Proton

7-12 Hz

R   H₂
  \   /
   C=C
  /   \
H₁   R

Trans-Proton

13-18 Hz

Pascal's Triangle only helps to predict the shapes of splits when all of the J-values are <u>assumed to be the same.</u>
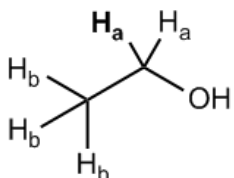
● When multiple J-values are involved, **tree diagrams** are needed to predict the shapes of the splits.

<u>Drawing Simple Tree Diagrams:</u>

First, let's use tree diagrams to help us understand why Pascal's Triangle and the **n + 1 Rule** make sense.

● Each split represents the J-value in Hz of a single proton. What does n + 1 predict here? _____

ANSWER

Hₐ Hₐ

Hᵦ
Hᵦ   OH
Hᵦ

H_b = Vicinal Proton = 6 Hz