H-NMR: Some Familiar Groups that can become Easy to Recognize

**Hydroxyl**
1H no splitting => hydroxyl. (Chem shift could be anywhere.)

**Aromatics**
5H in 7’s => mono-substituted benzene
4H in 7’s => di-substituted benzene
4H in 7’s, with 2 doublets = para di-substituted benzene

**Methyl Groups:** Clean 3H integral. What’s the Methyl Connected to? (each will integrate for 3H)
- 3H singlet in 3’s (3-4.5) => oxygenated methyl
- 3H singlet in 2’s (1.8-3) => allylic methyl. (Whether allylic to carbonyl, benzene, or alkene)
- 3H triplet in 1’s (0.7-2) => CH3-CH2
- 3H doublet in 1’s (0.7-2) => CH3-CH

**Ethyl Groups:** What’s the Ethyl Connected To?
Combination of a 3H triplet in the 1’s and a CH2 quartet-or-more in 3’s, 2’s, or 1’s

**When an ethyl is connected to a functional group, the CH2 will be a quartet**
- 2H quartet in 3’s (3-4.5) => oxygenated ethyl
- 2H quartet in 2’s (1.8-3) => allylic ethyl. (Whether allylic to carbonyl, benzene, or alkene)

**When an ethyl is NOT connected to a functional group, then the CH2 must instead be connected to an sp3 carbon that will probably have one or two hydrogens, so:**
- The chemical shift of the CH2 will be in the 1’s, and
- 2H sextet in 1’s => CH2CH2CH3 (methylene is connected to methyl triplet and a methylene)
- 2H pentet in 1’s => CHCH2CH3 (methylene is connected to methyl triplet and a methine)

**Isopropyl Groups:** What’s the Methine Connected To? (CH3)2CH – something

6H doublet in the 1’s combined with a 1H multiplet => isopropyl
Note: the CH must have at least 7 lines (or perhaps more)
- 1H multiplet in 3’s (3-4.5) => oxygenated isopropyl
- 1H multiplet in 2’s (1.8-3) => allylic isopropyl. (Whether allylic to carbonyl, benzene, or alkene)
- 1H multiplet in 1’s => isopropyl must be connected to an sp3 carbon

**Propyl:**
CH3CH2CH2-something
Will always have: 3H triplet 1’s and 2H sextet 1’s and a CH2 somewhere:
If the propyl is connected to a functional group, then there will be a CH2 pentet:
- 2H triplet in 3’s (3-4.5) => oxygenated propyl (plus CH2 sextet in 1’s and CH3 quartet in 1’s)
- 2H quartet in 2’s (1.8-3) => allylic propyl. (Whether allylic to carbonyl, benzene, or alkene)