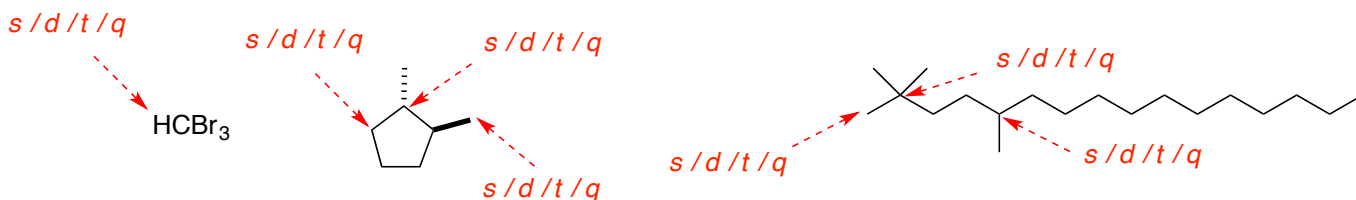


Differentiating CH, CH₂, And CH₃ In ¹³C Spectra

Circle *s*, *d*, *t*, *q* on the end of each arrow in the following diagram to indicate *singlet*, *doublet*, *triplet*, or *quartet* for the ¹³C resonances observed in a ¹³C NMR spectrum where the proton couplings are not totally removed.



The difference between peaks is called the *matching / coupling* constant and it is expressed in *ppm / Hz*. Couplings expressed as chemical shift differences would be the *same / different* on machines operating at different field strengths, so they are *always / never* quoted in this way.

DEPT Spectra To Differentiate Quaternary, Methine-, Methylene-, and Methyl-Carbons

As stated above, effects of proton coupling are almost always removed in ¹³C NMR spectra (partial decoupling experiments are relatively rare). DEPT is a special ¹³C NMR technique to differentiate between CH₂, CH & CH₃ together.

Carbons with no hydrogen atoms on them, *tertiary / quaternary*, *do / do not* show up in DEPT spectra. DEPT 135 spectra are usually presented with CH & CH₃ *negative / positive* peaks, and resonances for CH₂ carbons *negative / positive*.

DEPT 90 spectra only show *CH / CH₂ / CH₃* peaks.

Variations of DEPT *can / cannot* allow CH & CH₃ groups to be differentiated, but this takes more effort.

DEPT is a *more / less* effective way of differentiating methyl, methylene, methane, and quaternary carbons than partial decoupling, because the spectra are quicker to accumulate.