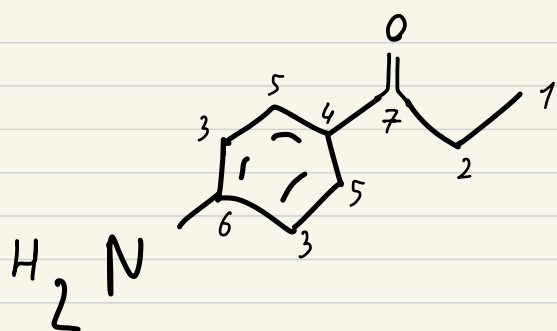
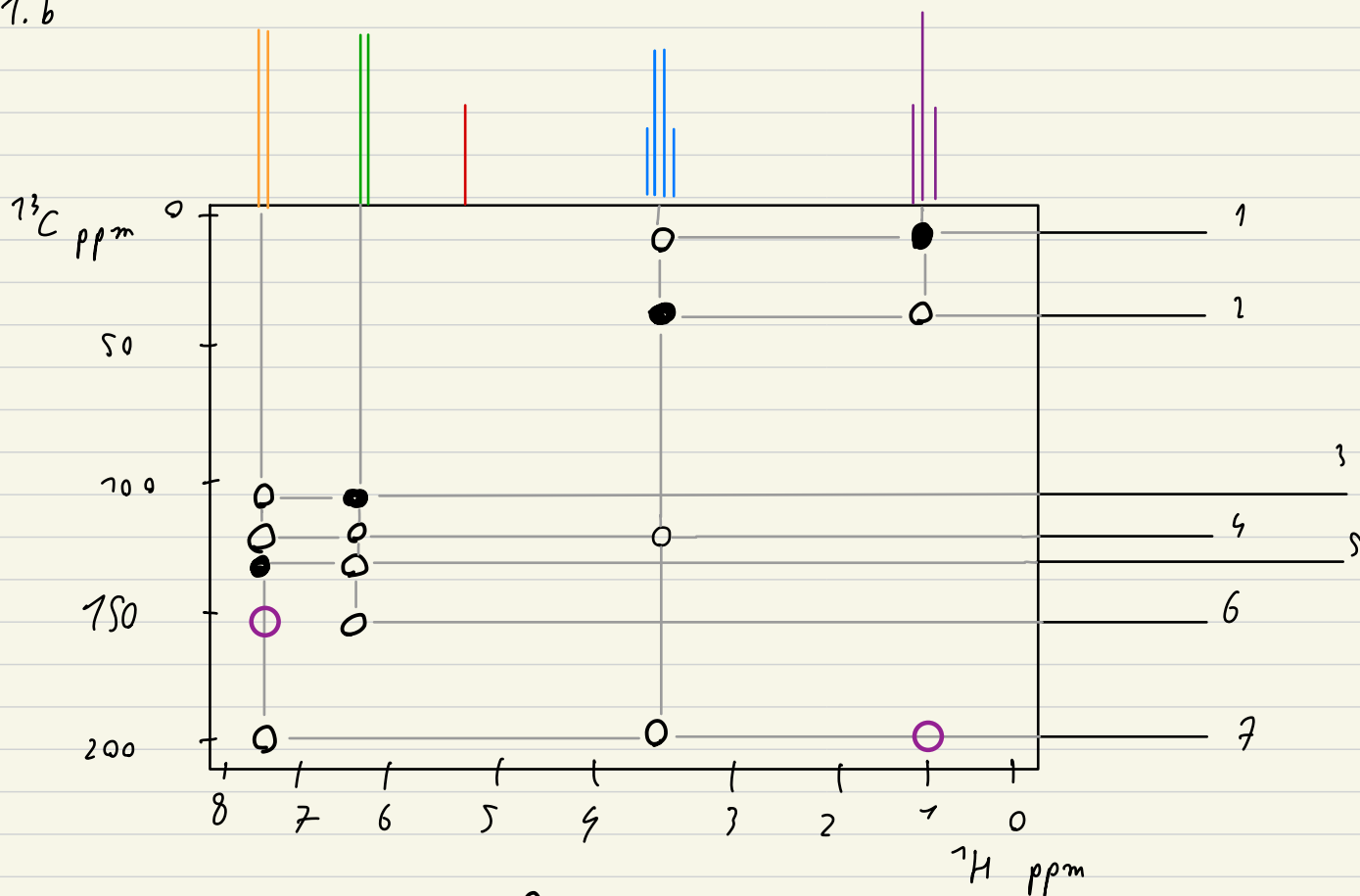




Great! Extra information: in solution state spectra, we don't usually see -NH<sub>2</sub> or -OH protons because they are rapidly exchanging with the solvent. Also, proton peaks on aromatic rings usually have complex splitting patterns, so we just draw/describe them as multiplets

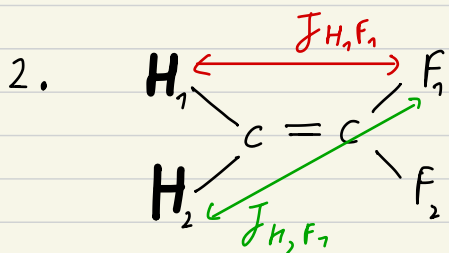
1. b



HMBC: ○

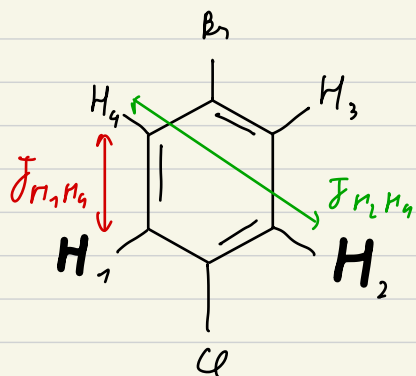
HSQC: ●

Also keep in mind that HSQC peaks will (usually) show up in the HMBC spectrum as well



The two hydrogens are chemically equivalent.

However, because  $J_{H_1F_1} \neq J_{H_2F_1}$ , they are magnetically not equivalent.



They are chemically equivalent but magnetically not equivalent because  $J_{H_1H_3} \neq J_{H_2H_4}$ .