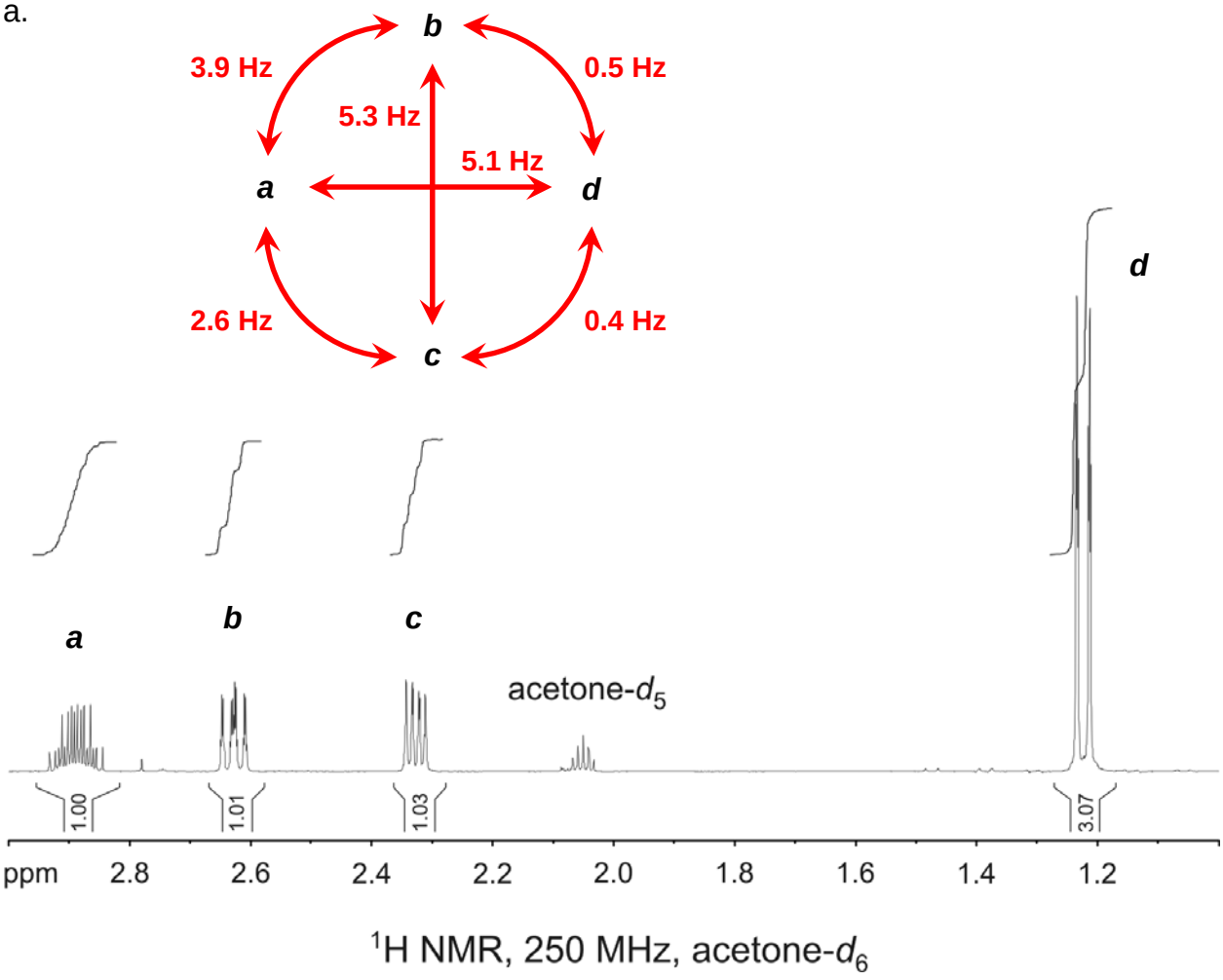
In-Class Exercise Solutions:
Deciphering Multiplets with Many *J*'s

a.



^{1}H NMR, 250 MHz, acetone-d_6

b. It's pretty clear based on chemical shift that ***d*** represents the methyl group, and because J = 5.1 Hz is the only large coupling constant resonance ***d*** shows, ***a*** must be the proton α to the methyl group. So, of the two -CH_2- protons, which is ***b*** and which is ***c***?

Looking at the structure of the molecule, the dihedral angle between proton ***a*** and its two neighbors at 0° and ~140°. I would expect that ϕ = 0° would maximize J (according to the Karplus equation), and ϕ = 140° would minimize J. So, I think that proton ***b*** is *cis* to proton ***a***, and proton ***c*** is *trans* to proton ***a***.