Lista de exercícios RMN e EPR

1. What magnetic field strength must be applied for proton spin transitions to occur at
   270.0 MHz?

2. It turns out that a proton chemical shift of 2.2 ppm corresponds to a frequency range
   of 1100 Hz on a certain NMR instrument. Determine the magnetic field strength of this
   instrument.

3. Show that a chemical shift range of 8.0 ppm corresponds to a frequency range of
   480 Hz on a 60-MHz instrument. What is the frequency range on a 270-MHz
   instrument?

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   480 Hz on a 60-MHz instrument. What is the frequency range on a 270-MHz
   instrument?

5. Faça um esquema do espectro RMN de uma molécula $A_3M_2X_4$ onde A, M e X são
   próton com diferentes deslocamentos químicos e $J_{AM}>J_{AX}>J_{MX}$

6. Make a rough sketch of what you think the NMR spectrum of methyl propanoate
   looks like.

7. Show that a two-spin system with J = 0 consists of just two peaks with frequencies

$$\nu_0(1 - \sigma_1) \text{ and } \nu_0(1 - \sigma_2).$$

8. The centre of the EPR spectrum of atomic hydrogen lies at 329.12 mT in a
   spectrometer operating at 9.2231 GHz. What is the g-value of the electron in the
   atom?

9. The EPR spectrum of a radical with a single magnetic nucleus is split into four
   lines of equal intensity. What is the nuclear spin of the nucleus?

10. The chemical shift of the CH3 protons in acetaldehyde (ethanal) is δ = 2.20 and
    that of the CHO proton is 9.80. What is the difference in local magnetic field
    between the two regions of the molecule when the applied field is (a) 1.5 T, (b)
    15 T