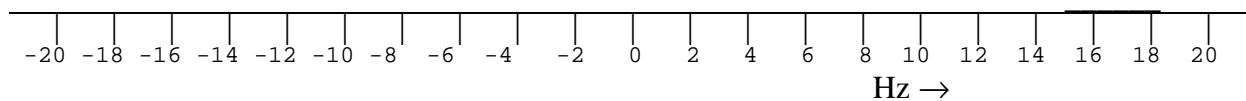
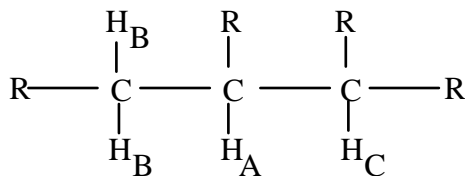


### CH342 Handin Homework 3

1. Show the spin-spin splitting pattern for nucleus A in the following molecular fragment.  $J_{AB} = 10$  Hz and  $J_{AC} = 15$  Hz. Indicate the relative intensities.



2. Normalize the wavefunction for the ground state of the harmonic oscillator:  $\Psi(x) = A e^{-1/2\alpha^2 x^2}$ .

3. Find the average position of the harmonic oscillator in its ground state. Hint: find the expectation value of  $x$  for the wavefunction given in the last problem.

4. Show that  $e^{-i\alpha x}$  is an eigenfunction of both the kinetic energy and momentum operators.