Chemistry H2A Problem Set 5 -Additional problem on vibrational spectroscopy.

Problem #1:

The OH radical is an important gas phase species in atmospheric chemistry. The radical ¹⁶OH has an OH stretching infrared vibrational frequency of 3546 cm⁻¹. Calculate the frequency (in Hz) you expect for the OD stretch of the radical ¹⁶OD (¹⁶O = 15.9994 amu, H = 1.0080 amu, D = 2.0141 amu).

Problem #2:

a) For each of the following three molecules, please report:

i) the number of normal mode vibrations observed for this molecule,ii) the molecular point group

iii) the character for each of the vibrational modes and the mode's degeneracy (you will have to look this up on the web or in a book)

iv) which vibrational modes are observed in the IR absorption spectrum,

v) which vibrational modes are observed in the Raman spectrum.

N₂O, BF₃, CCl₄

b) All of the bands of CCl₄ in the IR and Raman spectra are comprised of multiple peaks (see below for an example). Why are there multiple peaks in the vibrational spectra of this molecule? Can you identify them?



