## Question #51658, Chemistry, Physical Chemistry

Water is a non linear molecule. The number of modes of vibration of this molecule can predict the number of bands of IR spectrum. Justify or Explain.

## Answer:

The method of IR - spectroscopy allows to obtain information about the relative positions of the molecules within a very short time, as well as to evaluate the nature of the relationship between them, which is crucial in the study of structural and information properties of water systems.

It is known that the nuclei of molecules away from fixed positions relative to each other are in continuous oscillation state. An important feature of these variations is that they can be described by a limited number of fundamental vibrations (normal mode). Normal mode is called oscillation, in which the nuclei oscillate with the same frequency and in phase.

Isolated water molecule has three vibrational frequencies (3n-6 n = 3, n - number of atoms in a nonlinear molecule), which correspond to symmetric and asymmetric stretching vibrations of the O-H and H deformation vibrations angle H-O-H.

This means that the resonance will be composed of three frequencies and will be reflected on the graph three peaks.



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