Raman Spectroscopy

Assignment

B.Sc. (H) Chemistry

Dr Anil Kumar Singh
Department of Chemistry
Mahatma Gandhi Central University

Assignment

Q1. (a) What is meant by the term polarizability?
(b) State the selection rules for Raman scattering.
(c) What technological advances have enabled the routine use of Raman spectroscopy?

Q2. With which type of spectroscopy would one observe the pure rotation spectrum of H_2? If the bond length of H_2 is 0.07417 nm, what would be the spacing of the lines in the spectrum?

Q3. The spin of the hydrogen nucleus is $\frac{1}{2}$; does this make any difference to your answer to Problem 2?

Assignment

Q4. Which type of vibrational spectroscopy (IR or Raman) would you use to measure the vibrational frequency of the following bonds:

a. The stretching frequency of ^{14}N-^{15}N

b. The C≡C stretch in ethyne, HC≡CH

c. The C=O stretch in acetone, CH_3COCH_3

d. The Re-Re stretch of the inorganic cluster compound, $(CO)_5Re\text{-}Re(CO)_5$.

Q5. The Re-Re vibration of **$(CO)_5Re\text{-}Re(CO)_5$** is observed at 122 cm^{-1}, while that of the $Re_2Cl_8^{2-}$ occurs at 275 cm^{-1}. Without calculating separate force constants, calculate the ratio of the Re-Re bond force constants of the two molecules. Use your result to comment on the bond orders in the two species. (Note: Here, as frequently, it is a sufficiently good approximation to treat the vibration of the heavy Re atoms as being independent of the rest of the molecule.)

Submission Date: 30.04.2020

On Email address: anilkumarsingh@mgcub.ac.in