

Gaining Apex Coaching Centre

(Where Toppers make..... Toppers)

Compiled by: Dapinderjeet Singh

(B.Sc. III, Spectroscopy (Physical))

Assignment I

- 1) Using energy level expression and appropriate selection rules draw an energy level Diagram and spectral transition for the rotational Raman spectrum of rigid diatomic rotor
- 2) Write the expression for the rotational energy of diatomic molecule taking it as a rigid rotor. Draw the rotational energy level diagram for such a molecule
- 3) Explain why molecules behave as non-rigid rotors. Write expression for the wave number of rotational level of non-rigid rotor and hence derived an expression for the wave numbers of line produced
- 4) Derive appropriate expression to show that the spacing of lines in rotational spectrum is $2B$, where B is rotational constant. Show allowed transition on energy level diagram
- 5) State the Born Oppenheimer approximation in molecular spectroscopy Which of the molecule will infrared active ie show vibrational spectrum and why? H_2 or HCl
- 6) Out of H_2 , O_2 , N_2 , HCl , CO , NO , CO_2 , H_2O and CH_4 , which will give pure vibrational spectra and Why?
- 7) What is the effect of isotopic substitution on rotational spectrum
- 8) What do you understand by P,Q,R branches in Vibrational Rotational spectrum How are they formed
- 9) In the vibration rotation spectrum of diatomic molecule, why a line does not appear at the band centre?
- 10) In the vibration rotation spectrum of HCl why each individual line of the spectrum is found to consists of doublets?
- 11) Write the advantages of Raman Spectroscopy over infra-red spectroscopy
- 12) Explain the variation in the intensities of lines of Rotational spectra of diatomic molecule
- 13) Calculate the degree of freedom for CO_2 and water molecule
- 14) Explain the Franck Rule and explain its importance
- 15) Give an explanation for observing Rayleigh line and Raman Lines

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16) Why an oscillator be actually Anharmonic and write the selection rules for electronic spectroscopy



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