

Home Assignment
FYUGP Semester III
Subject: Chemistry
Paper: Molecular Spectroscopy
Session: 2026-27 (Odd semester)

1. Explain the Grotthus-Draper Law and the Stark-Einstein Law of photochemical equivalence with an example. 2
2. What is Beer-Lambert Law? Discuss its applications and limitations. 1
3. What is quantum yield? How is it measured for the photochemical process? 2
4. Draw a Jablonski diagram. Explain internal conversion, intersystem crossing, fluorescence and phosphorescence in that diagram and give a brief explanation about all these processes. 3
5. What are the primary and secondary processes in photochemical reaction? And how does it affect the quantum yield? Explain with examples. 3
6. What is Frank Condon principle? 1
7. How does electromagnetic radiation interact with matter? Explain by showing different energy terms associated with a molecule. 4
8. Explain the effect of isotopic substitution on the energy levels and rotational spectrum of diatomic molecules. 3
9. The rotational constant for H^{35}Cl is observed to be 10.5909 cm^{-1} . What are the values of rotational constant B for H^{37}Cl and for $^2\text{D}^{35}\text{Cl}$? 3
10. The rotational spectrum of $^{79}\text{Br}^{19}\text{F}$ shows a series of equidistant lines 0.71433 cm^{-1} apart. Calculate the rotational constant, B , and hence the moment of inertia and bond length of the molecule. 3
11. Explain the following trend of carbonyl vibrational frequency change: 4
Acid chloride > Ester > Aldehyde > Ketone > Carboxylic acid > Amide
12. Explain in brief the rule of mutual exclusion with example. 2
13. Give four differences between IR spectra and Raman spectra. 2
14. Describe the effect of temperature on Raman lines. 2
15. Give the differences between atomic and molecular spectra. 3
16. What are Rayleigh, Stokes' and anti-Stokes' lines? 3

Note: 1. Submit the assignment to the department on or before 28th October, 2026.
2. Write your Name, Roll no and **Paper name in Bold** in the front page of your assignment.
3. Don't use AI for writing the answers. If done so, mark will be deducted accordingly.