

M.Sc. CHEMISTRY
Second Semester (Repeat)
SPECTROSCOPY-I
(MSC - 204)

Duration: 20 minutes

Marks – 20

(PART A - Objective Type)

I. Choose the correct answer:

1×20=20

- For the molecule CH₃CHO
 - $I_a \neq I_b \neq I_c$
 - $I_a = I_b > I_c$
 - $I_a = I_b < I_c$
 - $I_a = 0$
- The spacing between rotational lines of HF molecule is 40cm⁻¹. The corresponding spacing of DF molecule is approximately
 - 21cm⁻¹
 - 7.5cm⁻¹
 - 10.5cm⁻¹
 - 30cm⁻¹
- Distance between the first stokes and first anti stokes lines of rotational Raman spectra is
 - 12B
 - 4B
 - 8B
 - 20B
- Pure rotational spectrum is exhibited by the molecule
 - H Br
 - CH₄
 - H₂
 - O₂
- The nucleus which has spin $\frac{3}{2}$ is
 - ³⁵Cl
 - ¹H
 - ¹⁵N
 - ¹⁴N
- Larmor frequency is given by
 - $\frac{eB\hbar}{2\pi\mu}$
 - $\frac{eB\hbar}{2\pi I}$
 - $\frac{eB\hbar}{2\pi\hbar}$
 - $\frac{eB\hbar}{2\pi I}$
- The nucleus which do not exhibit NMR spectra is
 - ¹¹B
 - ¹⁸O
 - ³¹P
 - ¹⁹F
- Pure rotational Raman spectrum is absent for the molecule
 - C₂H₂
 - CH₄
 - BF₃
 - SO₂
- IR inactive molecule is
 - CO
 - O₂
 - H₂O
 - NH₃
- The molecule BF₃ is
 - Prolate
 - Oblate
 - Spherical top
 - Asymmetric top
- The frequency range 7.5×10¹⁴Hz-----3.75×10¹⁴Hz belongs to the region of
 - IR
 - Micro-wave
 - Visible
 - Radio frequency
- The degeneracy of rotational energy levels is
 - J (J+1)
 - J² (J+1)²
 - (2 J+1)
 - $\sqrt{J(J+1)}$
- The frequency of first hot band is
 - $\bar{W}_e (i-2x_e)$
 - $2\bar{W}_e (1-3x_e)$
 - $\bar{W}_e (1-4x_e)$
 - $2\bar{W}_e (1-2x_e)$
- The distance between the 1st rotational spectral lines in P and R branch is
 - 2B
 - 6B
 - 4B
 - 8B
- Non zero value of $\frac{d}{dr}$ of molecule are found in the spectroscopy of
 - IR
 - NMR
 - Raman
 - ESR
- Radiations of wavelength range 200---400nm are obtained from
 - Halogen lamp
 - Mercury arc
 - Nernst filament
 - Deuterium lamp
- At low pressure line width of rotational spectral lines are due to
 - Heisenberg uncertainty relation
 - Collision broadening
 - Life time broadening
 - Doppler effect
- Successive lines are separated by 8 B in the Raman rotational spectrum of
 - N₂
 - HCl
 - CO
 - O₂
- The selection rule for R and P branches of rotational spectral lines are respectively
 - $\Delta J = 0, 1$
 - $\Delta J = -1, +1$
 - $\Delta J = 1, 0$
 - $\Delta J = +1, -1$
- The number of multiplet of - OH proton in pure and dry sample of ethanol in NMR spectra is
 - One
 - Two
 - Five
 - Three
