

G-1/116/21

Roll No.....

M.Sc. I Semester Examination, April-2021

CHEMISTRY

Paper IV

(Basics of Spectroscopy)

Time : 3 Hours]

[Maximum Marks : 80

Note : *All questions are compulsory. Question Paper comprises of 3 sections. **Section A** is objective type/Multiple Choice questions with no internal choice. **Section B** is short answer type with internal choice. **Section C** is long answer type with internal choice.*

SECTION 'A'

1×8=8

(Objective Type Questions)

Choose the correct answer :

1. Following pairs of molecules do not show IR-Rotational spectrum :
 - (a) CO_2 and NO_2
 - (b) O_2 and H_2
 - (c) N_2 and D_2O
 - (d) Cl_2O and N_2
2. Which one of the following are microwave active :
 - (a) O_2
 - (b) CO_2
 - (c) CH_3Cl
 - (d) N_2O

[4]

Or

Write the basic principles of photoelectron spectroscopy.

4. Which one of the following stretching vibration shown below is IR-inactive ?



Or

What is mutual exclusion principles ?

SECTION 'C' **12×4=48**

(Long Answer Type Questions)

Note : Answer the following questions in 500 words.

1. Describe the stark effect.

Or

Discuss rotational, vibrational and electronic energy level with diagram.

2. Explain the orbital angular momenta in P^2 , P^3 and d^2 configuration.

G-1/116/21

[3]

8. Total number of vibrations in allyl bromide $\text{CH}_2 = \text{CHCH}_2\text{Br}$ are :

- | | |
|--------|--------|
| (a) 18 | (b) 21 |
| (c) 14 | (d) 16 |

SECTION 'B' **6×4=24**

(Short Answer Type Questions)

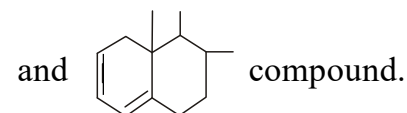
Note : Answer the following questions in 250 words.

1. Write note on intensity of spectral lines of rotational spectrum.

Or

Explain the selection rule for transition between the rotational energy levels.

2. Calculate the λ_{max} in UV-spectrum of 2, 4-hexadiene



Or

Explain Lambert-Beer's Law.

3. Discuss the charge transfer spectra.

G-1/116/21

P. T. O.

[2]

3. The ground term for $3d^9$ configuration is :
 - (a) $3P$ (b) 2D
 - (c) 1D (d) 1S
4. In alkali metal spectra energy component level (excluding S level) is :
 - (a) Doublet (b) Singlet
 - (c) Triplet (d) Quartet
5. Sources of irradiation in ESCA is :
 - (a) Halogen light (b) Sodium vapour lamp
 - (c) Monochromatic X-rays
 - (d) γ -rays
6. Fermi level is :
 - (a) $d-d$ transition (b) $M \rightarrow L$
 - (c) $D^{2/5}$ state (d) Zero potential energy
7. No rotational Raman effect is observed for :
 - (a) Spherical top molecules
 - (b) Symmetric top molecules
 - (c) Linear molecules
 - (d) Asymmetric top molecules

[5]

Or

Explain the absorption bands in UV-spectrum.

3. Discuss the electronic spectra of polyatomic molecules.

Or

Write the basic ideas of Auger-effect.

4. Discuss the fundamental bands and overtone.

Or

Write note on Coherent Antistokes Raman Spectroscopy (CARS).

★ ★ ★ ★ ★ c ★ ★ ★ ★ ★