

M. Sc. CHEMISTRY
4TH SEMESTER
SPECTROSCOPY-III
MSC-401

Duration: 20 Minutes

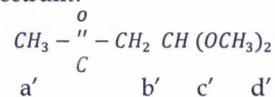
Marks: 20

[PART-A : Objective]

Choose the correct answer from the following:

1X20=20

1. Which hydrogens a' - d' in the following molecule gives a triplet signal in a normal ¹H NMR spectrum?



- a. Hydrogen c'
 b. Hydrogen b'
 c. Hydrogen a'
 d. Hydrogen d'
2. Which is the correct orders of increasing wave numbers of the stretching vibrations of (i) C-H (alkane), (ii) O-H (alcohol), (iii) C=O (ketone) and (iv) C≡C (alkyne)?
- a. (iii)<(iv)<(i)<(ii)
 b. (iv)<(iii)<(ii)<(i)
 c. (iii)<(iv)<(ii)<(i)
 d. (iv)<(iii)<(i)<(ii)
3. How many signals does the aldehyde (CH₃)₃CCH₂CHO have in ¹H NMR and ¹³C NMR spectra?
- a. Three ¹H signals and four ¹³C signals
 b. Five ¹H signals and six ¹³C signals
 c. Five ¹H signals and four ¹³C signals
 d. Three ¹H signals and six ¹³C signals
4. What is the X axis of a mass spectrum?
- a. Mass/charge
 b. Mass
 c. Charge
 d. Mass/energy
5. Which of the following is the definition of base peak of mass spectrometer? The peak corresponding to
- a. most abundant ion
 b. ion with lowest m/e
 c. molecular ion peak
 d. ion arising from loss of proton from the molecule

6. The product of the collision between high energy electrons and methane is
- a. CH₄⁻ + 2e⁻
b. CH₄⁺ + 2e⁻
c. CH₃⁻ + H[·]
d. CH₃[·] + H⁺ + 2e⁻
7. The spacing between the rotational lines of HF is 40 cm⁻¹. The corresponding spacing between rotational line in D F molecule is approximately
- a. 30 cm⁻¹
b. 20 cm⁻¹
c. 10 cm⁻¹
d. 15 cm⁻¹
8. Three rotational constants are found in the molecule
- a. CH₃F
b. H₂O
c. BCl₃
d. CH₄
9. Rotational constant of ¹⁴N₂ is 2 cm⁻¹. The frequency of Rayleigh line is 20487 cm⁻¹. Then the wave number of first Stokes line(in cm⁻¹) is
- a. 20499
b. 20475
c. 10795
d. 20479
10. The number of vibrational spectral lines common in IR and Raman spectra in CO₂
- a. 2
b. Zero
c. 1
d. 3
11. Proton NMR spectrum of HD molecule is
- a. a singlet
b. a doublet
c. a triplet with intensity ratio 1:1:1
d. a triplet with intensity ratio 1:2:1
12. The vibrational frequency and anharmonicity constant of an alkali halide molecule are respectively 300cm⁻¹ and 0.0025. The frequency of fundamental and first overtone are respectively in cm⁻¹
- a. 300,600
b. 301.5,604.5
c. 298.5,595.5
d. 290,580