

Seat No.:

**MARCH - 2022 (Summer session) Examination**

Subject Code: 80475

(विद्यार्थ्यांनी हा विषय कोड OMR वर लिहावा / Student should fill this code on OMR sheet)

Subject Name: Master of Science\_80475\_60841/74448/80475 - Advanced Spectroscopic Methods\_05.08.2022\_10.00 AM

Date: 05-08-2022

Time: 10:00:00 to 11:00:00

QP Code: 9527QP

Total Marks : 50 Each Question 2 Marks, Total 25 Ques, Duration 1 Hr

1. An organic compound with molecular formula  $C_3H_6Cl_2$  exhibits only one signal in the  $^1H$  NMR spectrum is .....

- a. 1,1-dichloropropane  
b. 1,2-dichloropropane  
c. 1,3-dichloropropane  
d. 2,2-dichloropropane

2. The wave numbers correspond to the wavelength  $2.5\mu m$  is ----

- a.  $14,000\text{ cm}^{-1}$   
b.  $4,000\text{ cm}^{-1}$   
c.  $3,600\text{ cm}^{-1}$   
d.  $400\text{ cm}^{-1}$

3. What is the correct order of  $\lambda_{max}$  for  $n \rightarrow \sigma^*$  transition?

- a.  $R-OH > R-NH_2 > R-SH$   
b.  $R-OH < R-NH_2 < R-SH$   
c.  $R-OH > R-SH > R-NH_2$   
d.  $R-OH < R-SH < R-NH_2$

4. The number of signals observed in the proton decoupled  $^{13}C$  NMR spectrum of  $(CH_3CH_2)_2C=CH-CH_3$  is:

- a. 4  
b. 5  
c. 6  
d. 7

5. Principal involved in the mass spectrometer is ----

- a. Excitation of electron  
b. Electron impact bombardment  
c. Molecular vibration  
d. Splitting of electrons magnetic energy

6. ----- bending vibration takes place in different planes.

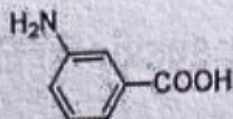
- a. Asymmetric stretching  
b. Rocking  
c. Scissoring  
d. Twisting

7. Which of the following compound having M.F.  $C_8H_6$  shows a sharp band at  $3300\text{ cm}^{-1}$  and a weak band at  $3085\text{ cm}^{-1}$ ,  $2110\text{ cm}^{-1}$

- a. Phenyl acetylene  
b. Phenyl propylene  
c. Phenyl ethylene  
d. Octene

8. Question

Calculate the  $\lambda_{\max}$  for the following compound



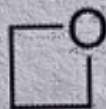
- a. 217 nm  
b. 230 nm  
c. 243 nm  
d. 250 nm

9. On increasing pH, phenol shows-----

- a. Bathochromic Shift  
b. Hypsochromic Shift  
c. Blue Shift  
d. None of these

10. Question

How many signals for following compound observed in  $C^{13}$  NMR spectroscopy?



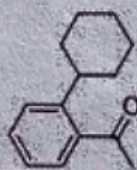
- a. 1  
b. 2  
c. 3  
d. 4

11. In the IR spectrum of Benzoyl chloride, a weak band appears near  $1750\text{ cm}^{-1}$  due to ----.

- a. Inductive effect  
b. Fermi resonance  
c. Conjugation effect  
d. Hyperconjugation effect

12. Question

Calculate the  $\lambda_{\max}$  for the following compound



- a. 249 nm  
b. 240 nm  
c. 230 nm  
d. 245 nm

13. How many vibrational modes are observed in acetylene

- a. 6  
b. 2  
c. 8  
d. 7

14. Which of the following compound with molecular formula  $C_4H_9NO_2$  shows  $^1H$ -NMR spectrum of  $\delta$  5.30 (s, 1H), 4.10 (q, 2H), 2.80 (d, 3H), 1.20 (t, 3H).

- a.  $CH_3NHCOOCH_2CH_3$   
b.  $CH_3CH_2NHCOOCH_3$   
c.  $CH_3OCH_2CONHCH_3$   
d.  $CH_3CH_2OCH_2CONH_2$

15. Nuclei with odd number of protons and odd number of neutrons will have spin quantum

number as ---

- a. 1/2  
c. 0
- b. 3/2  
d. 1

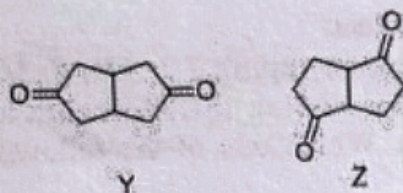
16. Which one of the following statements about the mass spectrum of  $\text{CH}_3\text{Br}$  is correct?

- a. The last two peaks are of equal size and occur at  $m/z$  values of 94 and 96  
c. There is just one peak for the molecular ion with an  $m/z$  value of 95
- b. The last two peaks have abundances in the ratio 3:1 and occur at  $m/z$  values of 94 and 96  
d. There is just one peak for the molecular ion with an  $m/z$  value of 94

17. Question

The number of signals that appear in  $^{13}\text{C}$  NMR spectrum of compounds

Y & Z respectively are:



- a. 5,5  
c. 3,4
- b. 4,5  
d. 5,4

18. Which of the following is not true about the  $M+1$  peak?

- a. It is one  $m/z$  unit higher than base peak  
c. It is one  $m/z$  unit higher than parent ion peak
- b. It is one  $m/z$  unit higher than molecular ion peak  
d. It occurs because there is more than one naturally occurring isotope of carbon

19. Choose the CORRECT statement from the following:

- a.  $^{13}\text{C}$  has more gyromagnetic ration than  $^1\text{H}$   
c. In  $^{13}\text{C}$  NMR, chemical shift decreases with increasing electronegativity
- b.  $^{13}\text{C}$  NMR shows more homonuclear coupling than  $^1\text{H}$  NMR  
d.  $^{13}\text{C}$  NMR requires large samples

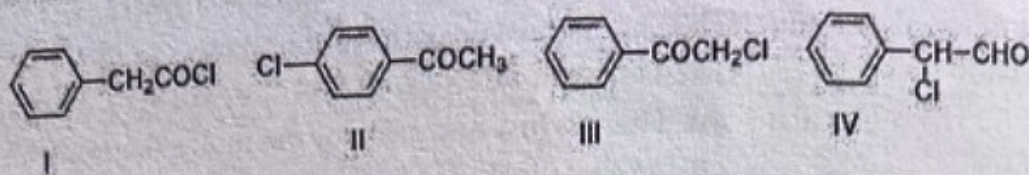
20. In mass spectra, the most intense peak is the ---

- a. Base peak  
c. Fragment ion peak
- b. Metastable ion peak  
d. Rearrangement ion peak

21. Question

spectrum

A compound of molecular formula  $C_8H_7ClO$  shows a prominent band in its IR spectrum at  $1690\text{ cm}^{-1}$ .  $^1H$  NMR spectrum revealed only two major types of protons in the ratio of 5:2. Which one of the following structures best fits the above data?

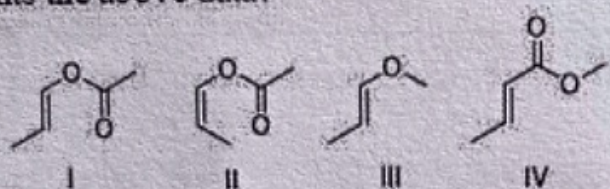


- a. I  
b. II  
c. III  
d. IV

### 22. Question

An organic compound exhibited spectral data:

IR:  $1760\text{ cm}^{-1}$ ;  $^1H$ NMR: chemical reference (ppm): 7.2 (1H, d, 16.0 Hz), 5.1 (1H, m), 2.1 (3H, s), 1.8 (3H, d,  $J=7.0\text{ Hz}$ );  $^{13}C$ NMR chemical reference (ppm): 170 (carbonyl carbon). Which one of the following structures best fits the above data?



- a. I  
b. II  
c. III  
d. IV

### 23. Choose the right statement

- a. Homoannular diene is called as transoid  
b. Cisoid shows less intense absorption  
c. The base value of transoid is 214 nm  
d. Exocyclic double bond causes a bathochromic shift of 30 nm

### 24. From the following, which compound has three types of hydrogens?

- a.  $Br-CH=CH_2$   
b.  $C_6H_5-CH_3$   
c.  $CH_3-CH_2-CH_3$   
d.  $CH_3-CH_2-CH(CH_3)-NO_2$

### 25. Question

Which of the following organic compound with molecular formula  $C_{10}H_{14}$  exhibited two singlets in the  $^1H$  NMR spectrum and three signals in the  $^{13}C$  NMR?

